# TECHNICAL REVIEW
# OF
# EXPRESSIONS OF INTEREST

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# NOTE

## TECHNICAL REVIEW OF EXPRESSIONS OF INTEREST

This Technical Review of Expressions of Interest presents the review and screening of the Expressions of Interest (EOIs) received by SWISC from respondents on the development of a comprehensive long-term waste management system for the Greater Toronto Area.

This report is being released by the Solid Waste Interim Steering Committee (SWISC) to the public and member Regional Councils in order to facilitate input to the SWISC planning process. The goal of SWISC is to develop a long-term waste management system for the Greater Toronto Area (GTA), to be in place by 1996, which is environmentally, socially, economically and technically sound.

This report has been prepared under the direction of the Technical Committee to SWISC. SWISC will make its final recommendations on the conclusions of this report only after it has received input from the public and Member Councils.

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## Note to the Reader

As part of the process for developing a long-term waste management system for the Greater Toronto Area, SWISC issued a Request for Expressions of Interest on 6 October 1989. Eighty-six Expressions of Interest were received on 28 December 1989. This Technical Review describes the responses and the analysis carried out.

Based on this analysis the Review recommends that SWISC:

- commit to the 3Rs Action Plan for increasing the amount of wastes diverted from disposal through Reduction, Re-Use and Recycling;
- issue requests for proposals through SWISC member Regions for material recovery and composting demonstration plants to confirm the suitability of various technologies to help achieve the 50% diversion target by year 2000;
- issue requests for proposals for energy from waste and/or landfill disposal facilities to dispose of wastes remaining after diversion;

The results of the 3Rs Action Plan, the demonstration plants and an ongoing research and development program will be used to select the most appropriate diversion facilities. These will be combined with the proposals received for the disposal facilities to choose a preferred long-term waste management system.

During the next three months, site selection criteria and other key issues described in Section 11 will be considered. Once this has occurred, the respondents who will be invited to submit proposals for demonstration plants and/or disposal facilities will be selected.

A summary of this report (Summary of Technical Review of Expressions of Interest) has been prepared for general distribution and to assist with the program of consultation with the participating municipalities, the respondents to the request for expressions of interest and the public.

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## GLOSSARY OF TERMS

Many of these terms have been taken from the Metropolitan Toronto Solid Waste Environmental Assessment Plan (SWEAP) Discussion Paper No. 7.1, and modified to suit the context of this report.

**3Rs** - the reduction, re-use and recycling of materials from waste prior to disposal.

**Addenda** - any addenda to the Request for Expressions of Interest which may from time to time be issued in writing by SWISC to amend, modify or supplement the Request.

**Aerobic** - the biological state of living and growing in the presence of oxygen (requiring the presence of free oxygen).

**Anaerobic** - the biological state of living and growing in the absence of oxygen (not requiring the presence of free oxygen).

**Baler** - a machine used to compress and bind solid waste or other materials (i.e. paper, metal, etc.) to facilitate transportation, storage or disposal.

**Biodegradable** - the ability of a substance to be broken down physically and/or chemically by micro-organisms.

**Biogas** - gas produced by the anaerobic digestion of organic material (predominantly methane and carbon dioxide).

**Blue Box System** - the curbside source separation recycling program currently in place in many municipalities in Ontario and to a large extent in the GTA.

**Bottom Ash** - means the ash residue, other than fly-ash, resulting from incineration where the waste is reduced to ashes containing by weight less than 10 percent of combustible materials (Ontario Reg. 309).



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**Certificate of Approval** - issued under Part V of the Environmental Protection Act, and provides conditional permission to operate a waste disposal site. It is required before a waste disposal management system site or facility can be used, operated, established, altered, enlarged or extended.

**Combustible Waste** - waste considered suitable for burning in an incineration or energy from waste facility.

**Combustible Gases** - gases or vapours suitable for burning as a fuel.

**Commercial Waste** - solid (non-liquid) non-hazardous waste that is generated from commercial establishments such as those generated by stores, offices, restaurants, warehouses, and other non-manufacturing activities, excluding residential and industrial wastes.

**Compost** - a relatively stable mixture of decomposed organic waste, which can be used to condition and fertilize soil.

**Composting** - an aerobic or anaerobic process involving the biological stabilization of organic waste.
- means the treatment of waste by aerobic decomposition of organic matter by bacterial action for the production of stabilized humus (Ontario Reg. 309).

**Construction and Demolition Waste** - means wastes resulting from construction, remodelling, repair and demolition of structures, road buildings and land clearing. Such waste include bricks, concrete and other masonry materials, soil, rock, lumber, road spoils, paving material, tree and brush stumps.
- rubble resulting from construction, remodeling, repair and demolition operations on houses, commercial buildings and other structures and pavements (MOE).

**Diversion** - the Reduction, Re-use and Recycling of waste prior to disposal by incineration and/or landfilling.

**Dry Waste** - separated from the wet organic fraction at source, dry wastes typically include paper, packaging, glass, metal, etc. Also see wet waste.



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**Energy-from-Waste (EFW)** - the production of energy in the form of steam, electricity or hot water from incinerating solid wastes either in bulk or in a shredded and classified form (refuse-derived fuel - RDF). Also referred to as waste to energy.

**Environment** - is defined in the Environmental Assessment Act, as follows:
"environment" means:

i) air, land or water,

ii) plant and animal life, including man,

iii) the social, economic and cultural conditions that influence the life of man or a community,

iv) any building structure, machine or other device or things made by man.

v) any solid, liquid, gas, odour, heat, sound, vibration or radiation resulting directly or indirectly from the activities of man, or

vi) any part or combination of the foregoing and the interrelationship between any two or more of them.

**Environmental Assessment** - a planning process by which the environmental effects of various alternative courses of action are identified and evaluated for the purpose of gaining approval for a proposed undertaking under the Environmental Assessment Act.

**Enhanced Blue Box** - increasing the basic set of recycled materials from newspaper, glass, cans and PET to include additional items like mixed plastics, fine paper, tires, household organics, etc.

**Evaluation Criteria** - a set of factors used to determine the suitability of two or more alternatives on the basis of a common method of comparison.

**Expanded Blue Box** - the introduction of the Blue Box program to areas which were not previously served by the program, including rural and commercial areas as well as apartment buildings.

**Fly Ash** - means particulate matter removed from combustion flue gases (Ontario Reg. 309).

- the airborne combustion residue from burning fuel,
- non-combustible particles carried by flue gas



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**Flue Gas** - the products of combustion, including pollutant, emitted to the air after a production process takes place.

**Hazardous Waste** - see Ontario Regulation 309 to the Environmental Protection Act.
- waste that poses a present or potential danger to human beings or other organisms because it is toxic, ignitable, explosive, reactive, corrosive, radioactive, pathological or has some other property that produces substantial risks to life.

**Incineration** - the controlled combustion process of burning solid, liquid of gaseous combustible wastes to gases and to a residue and ash containing little combustible material.

**Industrial Waste** - solid, non-hazardous waste generated by business and industry. Collection (and sometimes disposal) is usually the responsibility of the industrial generator. It does not include liquid waste or hazardous waste as defined by regulations.

**Landfill** - a land disposal site employing an engineered method of disposing wastes on land in a manner that minimizes environmental hazards by spreading wastes in thin layers, compacting, the wastes to the smallest practical volume, and applying cover materials at the end of each operating day (MOE).

**Landfilling** - means the disposal of waste by deposit, under controlled conditions on land or on land covered by water, and includes compaction of the waste into a cell and covering the waste with cover materials at regular intervals (Ontario Reg. 309).

**Leach** - to dissolve out by the action of a percolating liquid.

**Leachate** - a liquid produced from a land disposal cell that contains dissolved, suspended and/or microbial contaminants from the solid waste.

**Licence** - often used as a synonym for a Certificate of Approval.



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**Liner** - the material used on the inside of a landfill to ensure that the basin is impervious to fluids (MOE),
- an impermeable barrier manufactured, constructed or existing in a natural condition that is utilized to collect leachate (MOE).

**Liquid Waste** - refers to wastes which are pumpable under normal conditions.

**Magnetic Separator** - the process by which a permanent magnet or electromagnet is used to attract the magnetic (i.e. ferrous) materials away from mixed waste.

**Manual Separation** - the separation of waste materials by hand, sometimes called handpicking, in a recovery plant by picking out certain materials usually along a conveyor and often aided by front or back end mechanical processing.

**Material Recovery** - is a mechanical process utilizing equipment to recover and re-use a percentage of the waste fed in to the facility.

**Modular Units** - small scale units typically in the 50 to 100 TPD range which are factory constructed and shipped to the buyer ready to be installed with a minimum of field installation work.

**Municipal Solid Waste** - (MSW) solid non-hazardous waste generated from residential, commercial and institutional sources. It does not include liquid waste or hazardous waste.

**Municipal Waste Landfill** - a waste disposal site operating under a Certificate of Approval or Provisional Certificate of Approval as a landfilling site and authorized to accept for landfilling only domestic waste or only domestic waste in combination with either or both commercial waste or industrial waste but not including liquid waste or hazardous waste (MOE).

**Organic** - containing carbon.

**Plastics** - non-metallic compounds that result from a chemical reaction and are molded or formed into rigid or pliable structural material.



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**Processable Wastes** - those types of waste which would be suitable for recycle, reuse and/or recovery at an energy-from-waste or a materials recovery facility. Some processable wastes may be separated at source.

**Proven at a scale suitable for GTA**
- the scale of the component proposed in the EOI relative to the scale of the component(s) provided as a reference was not significantly different
- the period of time that the reference facilities had been operating successfully was for at least one or two years, with waste streams and operating conditions preferably similar to those in the GTA
- marketability of products, where applicable, was demonstrated for market potential in the GTA
- the ability of the component to meet SWISC's waste management principles and Ontario's legislative requirements was demonstrated by the reference facilities.

**Putrescible** - degradable by micro-organisms with sufficient rapidity as to cause nuisances from odours, gases, etc.; usually applied to the food and vegetable fraction of the waste stream.

**Pyrolysis** - the burning of waste in an oxygen deficient atmosphere.
- the chemical decomposition of organic matter through the application of heat in an oxygen deficient atmosphere.

**Recyclable Material** - means waste transferred by a generator and destined for a site,

i) where it will be wholly utilized, in an on-going agricultural, commercial, manufacturing or industrial process or operation used primarily for functions other than waste management and that does not involve combustion or land application of the waste,
ii) where it will be promptly packaged for retail sale, or
iii) where it will be offered for retail sale to meet a realistic market demand,

but does not include hazardous waste or liquid industrial waste unless the transportation from generator to site is direct (Ontario Reg. 309).
- a material that is used in place of a primary, raw, or virgin material in manufacturing a product and consists of materials derived from post consumer waste, industrial scrap, and material



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derived from agricultural wastes and other items, all of which can be used in the manufacture of new products (MOE).

**Recycling** - the use of a waste material as a replacement for all or part of a virgin material in a manufacturing process. For example, glass containers recycled to glass cullet used to produce more glass containers.

**Reduction** - includes measures for preventing the generation of, or facilitating the recycling of wastes. For example, the substitution of refillable bottles for a throwaway container.

**Refuse** - all solid materials which are discarded as useless.

**Refuse-Derived Fuel (RDF)** - refers to any usable fuel produced by mechanically, thermally, chemically, or biologically processing solid waste. Typically RDF is uniform in size and from which glass, metals, ceramics and other non-combustible materials have usually been removed.
- the combustible or organic portion of municipal waste that has been separated out and processed for use as fuel (MOE).

**Regulation** - a specific law that legally applies in all relevant situations.

**Regulation 309** - the set of rules under the Ministry of the Environment's Environmental Protection Act governing the identification, classification, registration and transportation of registerable wastes in the province.

**Residential Waste** - is solid non-hazardous waste generated from households. Also referred to as domestic or municipal solid waste (MSW). Collection of these wastes is the responsibility of the municipality. It does not include liquid waste or hazardous waste as defined by the regulations.

**Residue** - materials that remain after gases, liquids and/or solids have been removed. Solid or semisolid materials such as, but not limited to, ash ceramics, glass, metal and organic substances remaining after incineration or processing of waste.



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**Re-use** - the direct re-use of materials which would otherwise become waste, providing a means of reducing the quantity of waste destined for disposal. For example, the use of refillable bottles.

**Rotary Kiln** - a cylindrical, inclined device that rotates, thus causing solid waste to move in a slow cascading and forward motion while it is burned.

**Rubble** - broken pieces of masonry, concrete and asphalt.

**Scale Suitable for GTA** - see Proven.

**Sewage Sludge** - a semi-liquid substance consisting of settled sewage solids combined with varying amounts of water and dissolved materials. A product of sewage treatment.

**Shredder** - a machine used to break up waste materials into smaller pieces by cutting or tearing. A front end process used in some incineration and resource recovery facilities. Sometimes used prior to landfilling.

**Sludge** - any solid, semisolid or liquid waste generated from a municipal, commercial or industrial wastewater treatment plant, water supply plant, or air pollution control facility, or any other such waste having similar characteristics and effects. See also sewage sludge.

**Slurry** - a pumpable mixture of solids and fluid.

**Solid Waste** - non-hazardous, unwanted, discarded material (Also see Domestic Waste; Commercial Waste; and Industrial Waste and Construction and Demolition Waste).
- any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities (MOE).

**Solid Waste Management** - the systematic control of the storage, collection, transportation, processing and disposal of solid domestic/commercial and non-hazardous industrial waste.



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**Source Reduction** - reducing the amount of materials entering the waste stream by voluntary or mandatory programs to eliminate the generation of waste (MOE).

**Source Separation** - the segregation of various wastes at the point of generation (MOE),
- the setting aside of recyclable materials at the point of generation for segregated collection and transport to secondary materials facilities or specialized waste processing sites for recycling or final manufacture.

**Tipping Fee** - a charge established for the use of a waste management facility.

**Transfer Station** - any building, structure of combination of structures, machinery or devices at a facility where solid waste is temporarily stored prior to bulking and transport to a waste disposal site or treatment facility. Can be utilized as a waste processing facility.
- means a waste disposal site used for the purpose of transferring waste from a collection vehicle to another carrier for transportation to another waste disposal site (Ontario Reg.. 309).

**Volume Reduction** - reducing the volume of waste by mechanical or thermal means.

**Waste** - solid and non-hazardous garbage or refuse which no longer serves any useful purposes in its present form and is discarded by its owner.
- includes ashes, garbage, refuse, domestic waste, industrial waste or municipal refuse and such other wastes as are designated in the regulations (Environmental Protection Act).
- it does not include liquid waste or hazardous waste.

**Waste Disposal Site** - includes the fill area and the buffer area. Also referred to as a landfilling site.
- means any land or land covered by water upon, into, in or through which, or building or structure in which waste is deposited or processed and any machinery or equipment or operation required for treatment or disposal of waste (Environmental Protection Act).

**Waste Management System** - means all facilities, equipment and operations for the complete management of waste, including the collection, handling, transportation, storage, processing, and disposal thereof, and may include one or more waste disposal sites (Environmental Protection Act).



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**Waste Reduction** - the elimination, prevention or restriction of waste generation at its source.

**"Wet" and "Dry" Scrubbing Systems** - a scrubbing system is used to remove contaminants. A wet scrubber uses liquid reagents which are injected into the gas stream to neutralize acid constituents and remove them as soluble salts. In a dry scrubber, dry (powdered) reagents are injected into the gas stream to revitalize acid constituents which can be removed as solid residues (salts) downstream.

**Wet/Dry Collection** - the collection of solid waste at source by separation of the organic or wet components from the "dry" types of waste for processing.

**Wet Waste** - separated from the dry fraction, wet wastes typically include kitchen wastes, disposable diapers, etc. Also see dry wastes.



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## Abbreviations

| | |
|---|---|
| APWA | American Public Works Association |
| CAO | Chief Administrative Officer |
| CCME | Canadian Council of Ministers of the Environment |
| COFC | Containers on Flat Cars |
| EA | Environmental Assessment |
| EAA | Environmental Assessment Act |
| EFW | Energy from Waste |
| EOI | Expression of Interest |
| EPA | Environmental Protection Act |
| 4Rs | Reduction, Re-use, Recycling and Recovery of Materials |
| GTA | Greater Toronto Area |
| HHW | Hazardous Household Wastes |
| IPBF | Intermediate Processing and Benefication Facility |
| IRTCF | Intermodal Rail Transportation and Container Facility |
| MOE | Ministry of the Environment |
| MRF | Materials Recovery Facility |
| MSW | Municipal Solid Waste |
| MTPY | Million Tonnes per Year |
| OCC | Old Corrugated Cardboard |
| OMMR1-2 | Ontario Multi-Material Recycling Inc. |
| ONR | Ontario Northern Railway |
| ONTC | Ontario Northland Transportation Commission |
| PCDD | Polychlorinated Dibenzodioxins |
| PCDF | Polychlorinated Dibenzofurans |
| RDF | Refuse-Derived Fuel |
| REOI | Request for Expressions of Interest |
| RFP | Request for Proposal |
| SWEAP | Solid Waste Environmental Assessment Plan |
| SWISC | Solid Waste Interim Steering Committee |
| 3Rs | Reduction, Re-use, Recycling of Wastes |
| TOFC | Trailers on Flat Cars |
| TPD | Tonnes per Day |
| TPH | Tonnes per Hour |



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## 1.0 INTRODUCTION

On 6 October 1989, the Solid Waste Interim Steering Committee (SWISC) issued a Request for Expressions of Interest (REOI) for the Development of a comprehensive long-term solid waste management system for the Greater Toronto Area (GTA).

An evaluation of the Expressions of Interest (EOIs) received by SWISC on 28 December 1989 has been carried out. This report presents the results of this evaluation and provides recommendations on the next steps in the selection of the preferred long-term waste management system for the (GTA).

### 1.1 REPORT OVERVIEW

Section 1 describes the background to the formation of SWISC and the activities leading to the REOI, its purpose and the issue and receipt of the EOIs.

Section 2 describes the evaluation procedure followed.

Section 3 outlines the preliminary classification process used, summarizes the EOIs received by category, and describes the issuance of a request for additional information to allow assessment with respect to mandatory requirements.

Section 4 describes EOIs submitted as complete systems and identifies those to be considered further as systems and those to be considered as components only. Complete systems are then subjected to the screening process.

Section 5 provides a description and review of the EOIs submitted with respect to those components which would assist in meeting the 50% diversion target by the year 2000. The alternative diversion components are subjected to the evaluation procedure to assess which are appropriate for further consideration.

Section 6 provides a description and review of the EOIs submitted with respect to those components which would provide disposal of the wastes remaining after diversion. The



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alternative disposal components are subjected to the evaluation procedure to assess which are appropriate for further consideration.

Section 7 provides a description and review of the EOIs submitted with respect to those components, other than diversion and disposal, which would be part of a waste management system. These include transportation; research and development; facility siting; ownership and operation; and consulting services.

Section 8 contains a review of the Regions' waste management planning information and input from the Technical Committee to identify any technologies which were not included in the EOIs.

Section 9 assembles the information from the preceding sections to evaluate how acceptable components may be utilized to meet SWISC's principles for a long-term waste management system.

Section 10 presents SWISC's basic options for proceeding with the next stage in the development of the long-term waste management system based on the findings of the review of the EOIs.

Section 11 describes the next steps to be taken and issues to be resolved, to develop the recommended approach for the long-term waste management system.

## 1.2 BACKGROUND

On 14 March 1989, the Chairmen of the five regional municipalities that make up the GTA put forth a proposal outlining a collaborative and co-ordinated approach to solving the crisis of solid waste management. The background and highlights of this proposal are outlined in Appendix A of the Status Report issued in August 1989.

Meetings and consultations since the March announcement have resulted in a number of steps being taken to implement this innovative and complex solution. These steps were aimed at establishing a solid waste management system involving all stakeholders, including member regional municipalities, area municipalities, the Province and the public.



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The activities, developments and accomplishments since March 1989 are outlined in the August 1989 and April 1990 Status Reports. In summary, these have included:

- The Committee of Regional Chairmen was formalized to create SWISC.

- A Technical Committee, consisting of senior staff from the Regions and the Province, was established to advise SWISC on technical matters.

- All five Regions confirmed that they would continue to work towards a common response to the challenge of managing GTA solid waste.

- SWISC confirmed its commitment to meeting Provincial targets for waste diversion of 25% by 1992 and 50% by 2000.

  To this end, a subcommittee comprised of representatives of all five Regions has been formed to identify and implement actions which will be of mutual benefit to all Regions in achieving the maximum possible reduction, re-use and recycling (3Rs) of wastes from disposal as soon as possible. This 3Rs Action Plan will complement the overall waste management plan. (See Section 5.1 of this Report.)

- Procedures have been implemented to ensure member Regional Council participation and decision-making at each key stage in the development of the system.

- An Interim Chief Administrative Officer (CAO), Mr. John Farrow, Partner in The Coopers & Lybrand Consulting Group, was appointed. That firm has also been retained to undertake a study of joint management structure arrangements.

- Expert advisors have been retained as required. In this regard:

  - Environmental engineering consultants have been retained to prepare documents for the REOI, assist in the evaluation of EOIs and to prepare Requests for Proposals (RFPs) for a long-term solid waste management system.



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- Public consultation consultants have been retained to carry out an extensive public consultation program.

- Legal advice has been retained to ensure that the work will comply with the requirements of the Environmental Assessment Act (EAA) and all other pertinent legislation.

- Procedures have been initiated to nominate contingency sites to cover the shortfall in disposal capacity that may occur prior to the implementation of the long-term system, with approval pursuant to the Environmental Protection Act (EPA) required.

- A project financing formula has been developed to finance the activities of SWISC proportional to population and with 50% of the overall cost borne by the Province under existing municipal grant programs.

- A REOI was issued on 6 October 1989.

## 1.3 PURPOSE OF REQUEST FOR EXPRESSIONS OF INTEREST

Before issuing a RFP for a long-term waste management system or component, SWISC determined that it would first call for EOIs from public bodies, firms or individuals interested in developing or operating the long-term waste management system as a whole, or any component thereof.

This step was introduced:

- To provide more opportunities for public consultation;

- To establish a reasonable range of available alternatives, and to thereby simplify and support the RFP process.

The main purpose of the REOI was to assist SWISC in identifying the range of possible systems, system components, operational options and host communities appropriate to the long-term system. Information on the specific financial capability of respondents was not required at this time. It was made clear that all information contained in the EOI would be made public.



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Thus, a key objective of the EOI stage was for respondents to identify effective, innovative solutions. Respondents were requested to provide sufficient information to allow an appropriate "alternatives to" evaluation by SWISC in accordance with the meaning of the EAA.

An acceptable EOI was to include the information requested for one or more of the following:

- A long-term waste management system that can be approved and become fully operational as early as 1992, but in no event later than 1996,
- Any one or a combination of the following components of a long-term waste management system:
  - addition to participating municipalities' diversion programs
  - waste receiving and transfer systems
  - waste processing facilities
  - research facilities
  - transportation systems
  - waste disposal facilities, including landfill and/or EFW

The REOI made it clear that unless respondents submitted an EOI, they would not be allowed to submit a Proposal. This was necessary to promptly identify the range of options available to the GTA, and to be fair to respondents.

Within the REOI document, potential respondents received information on the existing solid waste situation in the Regions, the objectives of SWISC and the proposed solid waste management approval process.

Respondents were also made aware that there is no guarantee by SWISC or any of its members that the process for attaining a solid waste management system for the GTA will continue as set out in the Chairmen's Proposal and in the August 1989 Status Report. Further, it was made clear that any and all costs and expenses incurred by any person or group in connection with preparing a response to an REOI or relating to any other matter or thing contemplated by the Chairmen's Proposal or Status Reports, would be the sole responsibility of each such person or group.



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## 1.4 REQUEST AND RECEIPT OF EXPRESSIONS OF INTEREST

### Request for Expressions of Interest

In October 1989, SWISC advertised nationally and internationally regarding an open request for written submissions from any interested organization or group in the public, non-profit or private sectors. Interested parties were invited to contact the SWISC office to obtain a copy of the REOI document.

Those who registered with the SWISC office received all Addenda which had been issued. Over a period of three months, more than 100 potential respondents registered with the SWISC office and received the four Addenda which had been issued.

In addition to written information, SWISC held an Information Session in November for respondents to hear about the EOI process. A panel of advisors to SWISC gave a brief presentation and then responded to questions from the audience. A transcript of the Information Session was made available upon request to all respondents who were unable to attend the event.

### Receipt of Expressions of Interest

A total of 86 submissions was received by the deadline of 3:00 p.m. EST on 28 December 1989. There was a public opening of these documents which began at 3:15 p.m. that day. A list was developed the following day which stated the respondent's name, city and country. This list was posted in the SWISC office and was faxed to all registrants (see Table 1.1).

The EOIs were catalogued and distributed to the SWISC Technical Committee. In addition, the SWISC office briefly reviewed the submissions in order to develop a one-page Information Sheet on each submission which served as a quick index to the actual submissions. This list did not summarize, nor was it intended to summarize, the submissions, but rather to extract standard information from each EOI and serve as an indicator of what the reader would find upon closer examination of the submission.

On 10 January 1990, the EOI submissions were publicly released and a Briefing Session for the media held to this effect.



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In an effort to equip municipal officials with an understanding of SWISC, municipal offices whose communities were named in the EOIs were contacted by telephone and provided with an information package on SWISC. This was done before the media briefing so that the municipalities would be in a position to respond to questions.

At the Briefing Session the media were informed about SWISC's activities to date, and the receipt of EOIs was highlighted as a key point in the development of a GTA long-term solid waste management plan. In the package of materials provided to the media were the 86 Information Sheets referred to above, as well as background documentation on SWISC. The submissions were on display at that time for the attendees.

The 86 submissions were also made available for perusal at the five regional offices of the GTA through the Clerk's Department. In addition, copies of submissions could be obtained by completing an order form.



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TABLE 1.1

## LIST OF SUBMISSIONS RECEIVED BY SWISC BY 3:00 P.M., DECEMBER 28, 1989 WITH RESPECT TO THE LONG-TERM SYSTEM

| | Respondent | Initial Assessment of System &/or Component |
|---|---|---|
| 1. | Lamarche McGuinty Inc., Shawville, P.Q. | Component |
| 2. | Westinghouse Resource Energy, Pittsburgh, Penn. | Component |
| 3. | Advanced Ecology Corp., Vancouver, B.C. | Component |
| 4. | Dynavest International Ltd., St. Louis, Missouri | Component/System |
| 5. | St. Lawrence Cement Inc., Mont Royal, P.Q. | Component/System |
| 6. | Buhler-Miag (Canada) Ltd., Don Mills, Ont. | Component |
| 7. | Cogenesis Corp., Milpitas, California | Component/System |
| 8. | Lavalin Engineers Inc., Willowdale, Ontario | System |
| 9. | Foster Wheeler Power Systems Inc., Clinton, N.J. | Component/System |
| 10. | NSP Investments Ltd., Mississauga, Ont. | Component |
| 11. | Proctor & Gamble Inc., Toronto, Ont. | Component |
| 12. | Noel Richard Desautels & Paul Detering, Toronto, Ont. | Component |
| 13. | Dynaforce Waste Reductions Inc., Goderich, Ont. | Component |
| 14. | MacLaren Engineers Inc., Willowdale, Ont. | Component |
| 15. | Expocrete Ltd., Burlington, Ont. | Component |
| 16. | Armbro Materials & Construction Ltd., Brampton, Ont. | Component |
| 17. | Waste Distillation (WDT Canada) Inc., Montreal, P.Q. and Sussex Environmental Services Inc., London, Ont. | Component |
| 18. | WPF Corp., Bellevue, Ohio and BLI Intl. Inc., Ranch Cucamonga, California | Component |
| 19. | Kenox Corp., North York, Ont. | Component |
| 20. | See-Bah Waste Elimination Technologies Inc., Sault Ste. Marie, Ont. | Component/System |
| 21. | Round-Up Waste Prevention Inc., Canmore, Alta. | Component |
| 22. | Nera Bioenergy Corp., Montreal, P.Q. | Component |
| 23. | Swedish Trade Council | Undetermined |
| 24. | Environmental Disposal Systems Inc., Bristol, Virginia | Component |
| 25. | Kilborn Ltd., Toronto, Ont. | Component |
| 26. | Igloo Recycling System Inc., Toronto, Ont. | Component |
| 27. | Airtite Environmental Industries Inc., Richmond Hill, Ont. | Component |
| 28. | Superior-Crawford Sand & Gravel Ltd., Maple, Ont. | Component |
| 29. | EnComp Limited, Toronto, Ont. | Component |
| 30. | Compost Management Associates Ltd., Toronto, Ont. | Component |
| 31. | Reuter of Canada Inc., Toronto, Ont. | Component/System |
| 32. | Recomp Inc., Denver, Colorado | Component |
| 33. | TransCanada Pipelines, Calgary, Alta. | Component |
| 34. | Notre Development Corporation, North Bay, Ont. | Component |
| 35. | Environmax Corp., Caledonia, Ont. | Component/System |
| 36. | 808106 Ontario Inc., Cambridge, Ont. | Undetermined |
| 37. | Wood Waste solutions Inc., Toronto, Ont. | Component |
| 38. | Redipac Recycling Inc., Etobicoke, Ont. | Component |

| | Respondent | Initial Assessment of System &/or Component |
|---|---|---|
| 39. | SNC Inc., Montreal, P.Q. | Component |
| 40. | Crang & Boak Inc., Don Mills, Ont., H.D. Spencer Associates, Toronto, Ont. and Von Roll Limited, Zurich, Switzerland | Component |
| 41. | I-S-E Sales/Emerson Electric Canada, Markham, Ont. | Component |
| 42. | Browning Ferris Industries Inc., Toronto, Ont. | Component |
| 43. | Stinnes Enerco Inc., Toronto, Ont. | Component |
| 44. | Trican Energy Systems Ltd., Brantford, Ont. | Component |
| 45. | Wastestreams Systems Ltd.,, Toronto, Ont. | Component |
| 46. | Agra Industries Ltd., Mississauga, Ont. | Component |
| 47. | Nelson Aggregate Co., Burlington, Ont. | Component |
| 48. | Equity Waste Management of Canada Corp., Toronto, Ont. | System |
| 49 | Steetley Quarry Products Inc., Hamilton, Ont. | Component |
| 50. | Alternative Environment Corporation, Morristown, N.J. | System |
| 51. | WMI Waste Management of Canada Inc., Mississauga, Ont. | System |
| 52. | Ontario Northland Transportation Commission, North Bay, Ontario | Component |
| 53. | Ontario Northland Transportation Commission, North Bay, Ontario | System |
| 54. | Ontario Northland Transportation Commission, North Bay, Ontario | Component |
| 55. | Dual Environmental Systems Inc., Toronto, Ont. | Component |
| 56. | Chasson Pallets Ltd., Port Perry, Ont. | Component |
| 57. | Trow, Brampton, Ont. and Dames & Moore, Los Angeles, California | Component |
| 58. | Weldex Company Ltd., Oakville, Ont. | Component |
| 59. | Agripost, Pompano Beach, Florida | Component |
| 60. | Enviro-Watch Federation, Georgetown, Ontario | Undetermined |
| 61. | CN Rail and Bechtel Canada Inc., Toronto, Ont. | Component |
| 62. | CP Rail, Toronto, Ont. | Component |
| 63. | Royaledge Industries Inc., Burlington, Ont. and Pro-Cyss Waste Corp., Lakewood, Col. | Component |
| 64. | Wastech/Robert S. Lawrie Ltd., Markham, Ont. | Component |
| 65. | Otto-Canada Inc., Mississauga and Halton-Otto Recycling Ltd. | Component/System |
| 66. | Pattison Information Inc., Toronto, Ont. | System |
| 67. | Laidlaw Waste Systems, Burlington, Ont. | System |
| 68. | ICG Co-Gen Ltd., Toronto, Ont. | Component |
| 69. | MSW Recycling Corp., Toronto, Ont. | Component |
| 70. | Faruk Fattah, Toronto, Ont. | Component |
| 71. | Environmental Air Structure Technologies, Mt. Clemens, Michigan | Component |
| 72. | Markham Disposal/Miller Paving Ltd., Markham, Ont. | Component |
| 73. | Surety Environmental Inc., Calgary, Alta. | System |
| 74. | Bedminster Bioconversion Corp., Cherry Hill, N.J. | Component |
| 75. | Ontario Northland Transportation Commission North Bay, Ont. | Component |
| 76. | Muscillo Transport Ltd., Kleinberg, Ont. | Component |
| 77. | Montenay-Inc., Montreal, P.Q. | Component |

| | Respondent | Initial Assessment of System &/or Component |
|---|---|---|
| 78. | Ogden, Martin Systems, Mississauga, Ont. | Component |
| 79. | Ortech International, Mississauga, Ont. | Component |
| 80. | Paul Temelini, Sudbury | Undetermined |
| 81. | Methon Energy Corp. Inc., Maple, Ont. | Component |
| 82. | Chivers-Wilson Consulting, Nepean, Ont. | Undetermined |
| 83. | Renutech Corp., Ottawa, Ont. | Undetermined |
| 84. | W. Hutchinson, Walkerton, Ont. | Component |
| 85. | Stone & Webster Ltd., Toronto, Ont. | Undetermined |
| 86. | Standard Aggregates Inc. | Undetermined |

## 2.0 EVALUATION PROCEDURE

The SWISC selection process for the preferred system and components must meet the requirements of the EAA and is described in more detail in a separate working paper. The EAA requires that a reasonable range of alternatives be identified for evaluation based on a clearly defined and logical screening process of available options. Once the reasonable set of alternatives has been selected (both alternatives to the undertaking and alternative methods of carrying out the undertaking), each alternative must be evaluated in a systematic and traceable manner based on a net effect analysis and advantages/disadvantages assessment. This evaluation process results in the selection of the preferred system and system components for waste management.

To meet these requirements, SWISC designed an innovative approach to planning which involved the reliance on a two stage process to provide the basis for detailed analysis of alternatives. Each EOI was expected to describe in a generic way, the environment that might be affected and the effects that might be caused by their proposals and any actions necessary to prevent, mitigate or remedy these effects, and to evaluate the advantages and disadvantages to the environment. Based on a set of principles and evaluation criteria, SWISC planned to evaluate the analyses received and select the preferred system and system components. The evaluation criteria is described in Section 2.1 for systems and 2.2 for components. The six SWISC principles are listed below:

**Diversion**

To aim at fulfilling provincial targets for diversion of solid wastes from disposal (25% by 1992 and 50% by 2000). Disposal of residual waste refers to landfill, energy from waste and other environmentally acceptable methods.

**Proven Technology**

To develop a system based on proven technology for processing solid wastes to eliminate objectionable characteristics associated with some traditional waste management systems and to meet the requirements for approval under the Environmental Assessment Act, the Environmental Protection Act and other pertinent statutes.



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**Innovation**

To construct an innovative framework for new research and development in the area of solid waste reduction, re-use and recycling and recovery.

**Receptive Communities**

To locate facilities, if possible, in receptive communities and maximize industrial development opportunities for those communities.

**Collaboration**

To create a waste management structure that will allow maximum collaborative efforts between municipal, regional, provincial and federal authorities, which best combines the efforts of the public and private sectors, and which best serves as a world-class model for environmentally sound waste management systems.

**Cost Effectiveness**

To provide a cost-effective solution to the problem of solid waste management while reducing environmental degradation and the real costs associated with conventional waste management systems.

As previously noted, the tendering process was to be a two stage process. The first stage, which is the Request for EOI, is documented in this report. It was designed to identify and evaluate all reasonable functionally different alternatives (alternatives to the undertaking) and to select preferred waste management systems. The second stage was to be the Request for Proposals (RFPs), which was designed to select the preferred system and components (alternative methods of carrying out the undertaking).

The success of the approach was based heavily on the amount of information contained in the EOIs and RFPs to be received by SWISC. As the EOIs were analyzed, it was apparent that while they represented a successful identification of options, they did not provide enough detail for the determination of the preferred system(s) or preferred components.



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Instead the EOI process identified all available options and screened them into categories for further action. Because of the comprehensive advertising program that was carried out, 86 EOIs were received. The review of the five member Regions' waste management planning efforts together with the review of waste management options by the Technical Committee of SWISC, and the SWISC 3Rs Action Plan for Waste Diversion confirmed that the EOI process had indeed identified all available waste management options.

Based on the set of criteria developed for evaluating the EOIs, SWISC screened the available options into five categories based on the degree to which the criteria were met.

- Unacceptable Options

  If the proposed option did not meet the mandatory criteria and did not show promise when compared to the remaining criteria or did not contain sufficient information, it was dropped from further evaluation.

- Acceptable Options

  If all the criteria were met to a reasonable degree, the option was considered to represent an alternative which could be implemented immediately or further evaluated at the full scale RFP stage. This would be done using a net effects analysis and advantages/disadvantages assessment.

- Potential Options

  If the option reasonably met all the criteria, but lacked the proven ability to scale up as proposed by the EOIs, it was considered to be an alternative requiring further testing and was placed in the demonstration category. The technology would be part of a demonstration program designed to identify and resolve any problems which might arise through scaling-up the facility. Once any problems had been addressed, the technology would be ready for a net effects analysis and advantages/disadvantages assessment.



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- Research and Development

  If the technology was considered to have potential, but required further research for its full development, it was placed in the research and development category.

- 3Rs Action Plan

  If the option or idea submitted was considered to have potential to assist SWISC in the short-term, it was referred to the 3Rs Action Plant for further consideration.

The results of this screening are described in Sections 4 to 7. Section 11 describes the steps proposed to continue the development of the long-term waste management system. Those EOIs which would be requested to respond to RFPs would be selected after the additional steps described in Section 11 have been addressed.

The 86 EOIs were classified into those categories which proposed complete systems, partial systems or various components of a system. The evaluation was carried out for systems and components as follows and is illustrated in Figure 2.1.



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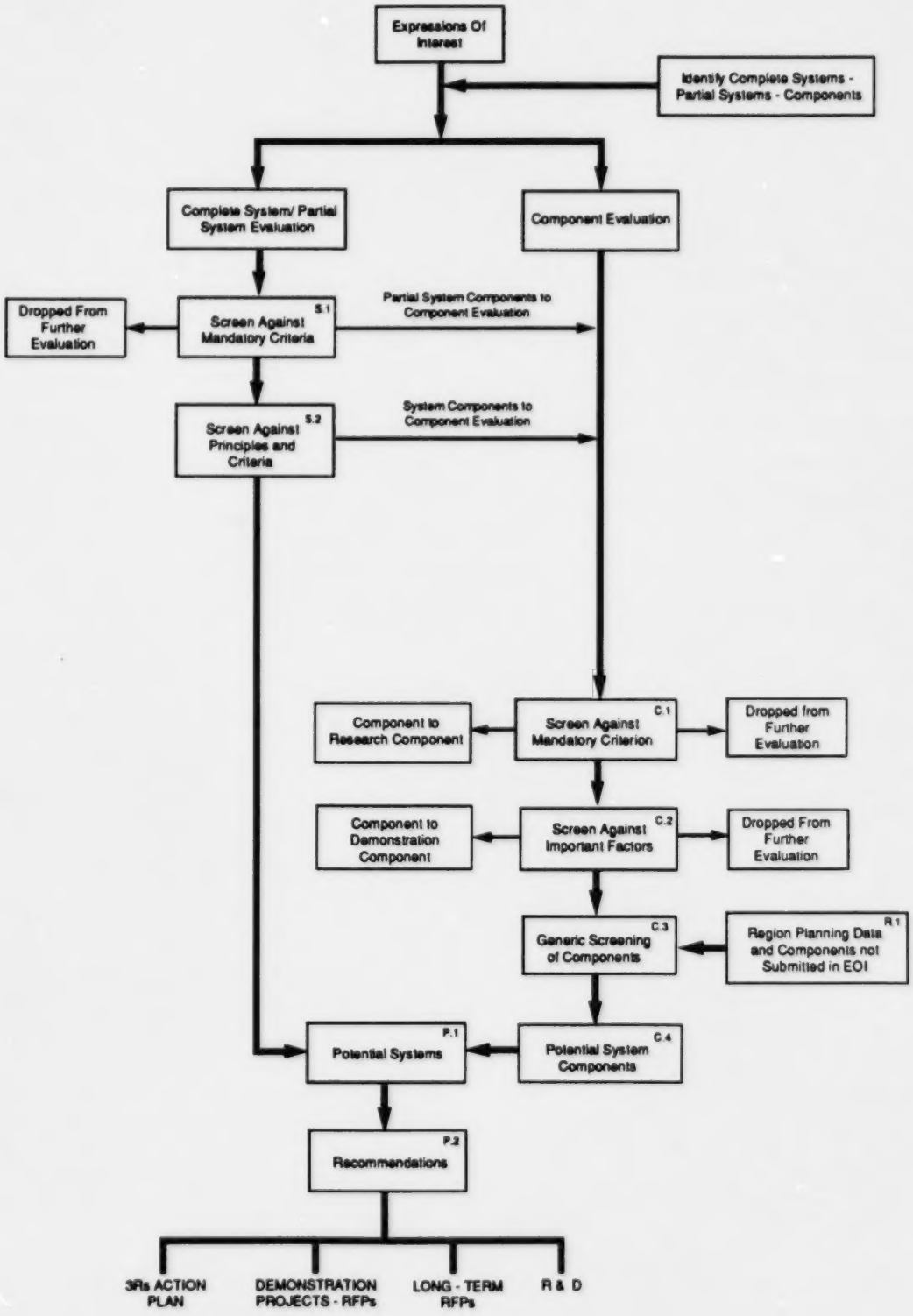
## FIGURE 2.1: EVALUATION FRAMEWORK FOR EXPRESSIONS OF INTEREST - GTA LONG-TERM WASTE MANAGEMENT SYSTEM



## 2.1 SYSTEMS

Those EOIs which proposed complete systems, or which appeared to offer the basic elements of a complete system, were screened as described in Section 4.0 to determine whether they had the potential to offer a complete or partial system. The system screening procedure compared the responses against the following mandatory criteria and are noted on Tables 2.1 and 2.2.

MANDATORY CRITERIA (Step S.1) (See Table 2.1)

**Achieve 50% Diversion of Waste (Step S.1-1)**

The initial check of compliance with this criterion was based on the respondent's claims. These were subjected to confirmation through the subsequent examination of each component.

If the criterion was not met, then the system or partial system was rejected as a system and its components moved to the component evaluation process.

**Proven Success of System at Scale Suitable for the GTA (Step S.1-2)**

The responses were also screened to determine whether there were existing operations similar to those being proposed in the EOIs which: 1) were proven to be successfully operating; and 2) could be scaled up for use in the GTA as proposed by the Respondent. Each component was then addressed in more detail in the component evaluation.

If the EOI did not indicate compliance with this criterion, the system or partial system was referred to the component evaluation or dropped from further evaluation.

**Initial List of Components in the System**

From the information submitted, the components of the system were identified to develop an overall picture of each system and of any obvious omissions which would classify the EOI as a partial system. Both complete systems and partial systems were screened against the initial list of components.



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System and partial systems which did not meet the criteria were moved to the component's evaluation process.

Those systems which had not provided sufficient information to allow evaluation under Step S.1 were not considered further.

**SWISC's Principles and Criteria (Step S.2)**

Those systems which passed the Step S.1 screening were examined further relative to SWISC's principles and criteria as illustrated in Table 2.2. Again because of the lack of sufficient detailed information, this was done on a general basis.

If the system did not substantially meet the requirements of the principles and criteria, the components of the system were placed in the component evaluation procedure.

If the system appeared to meet the principles and criteria the system was considered further in the evaluation process. Not withstanding the above, all components of a system were evaluated in the component evaluation procedure.

## 2.2 COMPONENTS

Those EOIs which provided specific components only were screened, along with system components, through the following procedures in Section 5. The information obtained from the Region's waste management planning in Section 8 was reviewed to ensure that all potential components were included. The components were classified in accordance with those required to make up a complete system as described in the initial list of components in Table 2.1.

MANDATORY CRITERIA (Step C.1) (See Table 2.3)

**Proven success of operation at scale suitable for GTA (Step C.1)**

The component was examined with respect to:

- the scale of the component proposed in the EOI relative to the scale of the facilities provided as reference;



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- the period of time that the reference facilities had been operating successfully (preferably for one or two years with wastes and conditions similar to those in the GTA).

- the marketability of products, where applicable, with respect to market potential in the GTA.

- the ability of the component to meet SWISC's waste management principles and Ontario's legislative requirements.

Some components might be operating satisfactorily at a small scale and could be used by SWISC for a limited number of small operations, but would not meet this proven criterion if proposed for a major role in the waste management system. The responses were classified as follows:

(a) If the response was completely unsuitable, it was dropped from further evaluation.

(b) If the response did not meet the mandatory criterion but appeared to have potential and appeared to warrant further research it was directed to the R&D component.

(c) If the response was for a component which was considered as a key element in the system and appeared to be close to meeting the criteria, it was still carried forward to Step C.2.

(d) If the response fulfilled the criterion, it was carried forward to each subsequent step.

**Important Factors (Step C.2)**

For each component, those EOIs carried forward from Step C.1 were grouped on the basis of common features and screened against three important factors (see Table 2.3), namely:



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- demonstrated ability to meet environmental requirements
- flexibility of the component to incorporate future developments
- operation by 1996 at latest.

This step involved utilizing information from Step C.3. Where it was deemed helpful to the evaluation, the advantages and disadvantages of the component were presented.

(a) If the response or group of responses, failed to meet these three criteria, it was rejected outright.

(b) If the response, or group of responses, failed to meet the criteria but appeared to have long-term potential, it was referred to the R&D component.

(c) If the response, or group of responses, met the criteria, it was carried forward to Step C.3.

**Common and Specific Criteria (Step C.3)**

Each component was compared with common criteria (see Table 2.3) and specific criteria (see Table 2.4) to further assess on a generic basis the suitability of the components.

**Potential System Components (Step C.4)**

From this evaluation, the most suitable components, and where possible the preferred technologies (Section 9), were identified for consideration in Step P.1.

**Potential Systems Options (Step P.1)**

From those components identified in C.4 above, alternative basic long-term system options were developed in Section 10.



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**TABLE 2.1: SYSTEM EVALUATION STEP S.1**

| SCREENING OF LONG-TERM WASTE MANAGEMENT SYSTEMS |
|---|
| **MANDATORY CRITERIA (STEP S.1)** |
| 1. Achieve 50% diversion of waste |
| 2. Proven success of system at scale suitable for GTA |
| **INITIAL LIST OF COMPONENTS IN SYSTEM** |
| (a) Addition to the Participating Municipalities' Diversion Programs |
| (b) Receiving Point(s) for Waste From Participating Municipalities |
| (c) Receiving Facilities |
| (d) Transportation to Processing/Disposal Facility(ies) |
| (e) Processing Facility(ies) |
| (f) Disposal Facility(ies) |
| (g) Research Facility(ies) and Demonstration Projects |
| (h) Other |
| (i) Short-Term Systems Included? (REOI p.40) |
| |

**TABLE 2.2: SYSTEM EVALUATION STEP S.2**

| SCREENING OF LONG-TERM WASTE MANAGEMENT SYSTEMS |
|---|
| **PRINCIPLES AND CRITERIA (STEP S.2)** |
| *Principle 1 - To aim at fulfilling provincial targets for diversion of solid wastes from disposal.* |
| 1. Additional percentage of wastes diverted |
| 2. Markets proposed for materials diverted |
| 3. Flexibility with respect to future technological and market developments |
| |
| *Principle 2(a) - To consider alternative methods of disposal of residual wastes.* |
| 1. Landfill |
| 2. Energy from waste |
| 3. Other environmentally acceptable method |
| |
| *Principle 2(b) - System based on proven technology and meets environmental and other approval requirements.* |
| 1. Use of more advanced alternatives |
| 2. Period of time when the proposed system is potentially viable (years) |
| 3. Flexibility with respect to future technological developments |
| |
| *Principle 3 - Construct an innovative framework for new research and development in the 4Rs.* |
| 1. New research and development programs |
| 2. Likelihood of results in short term and/or long term |
| |
| *Principle 4 - Locate facilities in receptive communities and maximize industrial development activities.* |
| 1. Inclusion of a willing and appropriate host community(ies) |
| 2. Industrial development in the host community(ies) |
| 3. Jobs created in the host community(ies) |
| 4. Adequate infrastructure in place in host community(ies) |
| |
| *Principle 5 - Allows for maximum collaboration, best combines efforts and serves as a world class model.* |
| 1. Flexibility of Respondents to consider collaborative efforts in ownership and operation |
| 2. Suitability of preferred alternatives for collaborative efforts |
| 3. Provision of short-term contingency facilities |
| |

**TABLE 2.3: COMPONENT EVALUATION - STEPS 1,2 AND 3**

| SCREENING OF COMPONENTS OF LONG-TERM WASTE MANAGEMENT SYSTEM | |
|---|---|
| **COMPONENT:** (Component Name)* | |
| **MANDATORY CRITERION (STEP C.1)**** | 1. Proven success of operation at scale suitable for GTA |
| **IMPORTANT FACTORS (STEP C.2)** | 1. Demonstrated ability to meet environmental requirements<br>2. Flexibility of the component to incorporate future developments<br>3. Operation by 1996 at latest |
| **COMMON CRITERIA (STEP C.3)** | |
| *A - Human Health and Safety (Net Effects)* | |
| A.1 Potential for contamination of ground or surface water | |
| A.2 Potential for air emissions, noise and odour | |
| A.3 Potential for nuisance factors (litter, rodents, birds, etc.) | |
| A.4 Potential for increased traffic and hazards | |
| A.5 Degree of maintenance and safety programs required | |
| | |
| *B - Natural Environment (Net Effects)* | |
| B.1 Potential loss of mineral resources | |
| B.2 Potential loss of agricultural soils | |
| B.3 Potential loss of forest resources | |
| B.4 Potential disruption to terrestrial ecology | |
| B.5 Potential disruption to aquatic ecology | |
| B.6 Potential disruption of floodplain areas | |
| | |
| *C - Social/Cultural (Net Effects)* | |
| C.1 Location of facilities relative to GTA | |
| C.2 Status of acceptability to host community and government | |
| C.3 Compatibility with community land use, plans and policies | |
| C.4 End use, perpetual care and close out requirements | |
| C.5 Potential effect on community heritage and quality of life | |
| C.6 Potential for community benefit | |
| C.7 Requirement for new infrastructure | |
| | |
| *D - Technical* | |
| D.1 Extent of advanced technologies used | |
| D.2 Flexibility of component to incorporate future developments | |
| D.3 Energy and utility requirements | |
| D.4 Ownership and operation options | |
| D.5 Flexibility to use component in system | |
| D.6 Suitability for collaborative efforts | |
| D.7 Requirement for operations and surveillance monitoring | |
| D.8 Features of transportation to facilities | |
| | |
| *E - Planning Framework* | |
| E.1 Anticipated life of component | |
| E.2 Provision of contingency facilities for short-term needs | |
| E.3 Status of component with respect to approvals | |
| E.4 Time required for construction and implementation | |
| E.5 Contingency plans for time delays and malfunctions | |
| | |

* Similar table prepared for each component

** See Figure 2 for the location of steps in the evaluation process.

**TABLE 2.4: COMPONENT EVALUATION - SPECIFIC CRITERIA**

| LIST OF COMPONENTS WITH SPECIFIC CRITERIA FOR STEP C.3 EVALUATION | |
|---|---|
| **COMPONENT:** | Addition to the Participating Municipalities Diversion Programs |
| **Specific Criteria:** | a) Percentage of diversion by year<br>b) Method of measurement<br>c) Reliability of response to meet proposed % of diversion<br>d) Compatibility with Regions' systems<br>e) Type of end products and marketability |
| **COMPONENT:** | Receiving Point(s) for Waste from Participating Municipalities |
| **Specific Criteria:** | a) Suitability for existing and future GTA operations<br>b) Conditions on wastes delivery by participating municipalities |
| **COMPONENT:** | Receiving Facility(ies) |
| **Specific Criteria:** | a) Manner of waste receiving relative to Municipalities capabilities<br>b) Type and reliability of the receiving and processing components<br>c) Use of existing facilities/modifications |
| **COMPONENT:** | Transportation to Processing/Disposal Facility(ies) |
| **Specific Criteria:** | a) Complexity of the System<br>b) Suitability with respect to existing transportation systems |
| **COMPONENT:** | Processing Facility(ies) |
| **Specific Criteria:** | a) Percentage of diversion by year<br>b) Method of measurement<br>c) Proven reliability and experience with facility to meet percentage of diversion by year |
| **COMPONENT:** | Disposal Facility(ies) |
| **Specific Criteria:** | a) Extent of site investigations substantiating viability of facility |
| **COMPONENT:** | Research Facility(ies) |
| **Specific Criteria:** | a) Appropriateness to objectives of SWISC and preferred system<br>b) Location of facility (Host community for disposal?) |

# 3.0 EXPRESSIONS OF INTEREST RECEIVED

## 3.1 CLASSIFICATION OF EOIs

The 86 submissions referred to in Section 1.4 are listed in Table 3.1 presenting in greater detail the facilities proposed in each EOI. It should be used as a guide to identify the section of the report where a particular EOI has been evaluated.

**Table 3.1 has also been used to indicate the findings of the evaluation process with respect to the various components. As described in Section 2.0, they are referred for further consideration under the 3Rs Action Plan; under RFPs for demonstration projects; under RFPs for full scale facilities; or for potential research and development. Those respondents who will be requested to participate further in any of these, will be selected only after the issues described in Section 11.0 have been addressed by SWISC.**

This section of the report presents an overview of the EOIs received by category. Each category is addressed in subsequent sections of the report. The categories of facilities include:

**SYSTEMS (Section 4.0)**

**Complete Systems (Section 4.1)**
These submissions include reference to all the components and facilities required to provide a long-term waste management system as identified in Table 3.1, namely: additions to Municipalities' diversion programs; processing; disposal; transportation and research and development.

**Partial Systems (Section 4.2)**
Although claiming to offer a complete system, specific components or facilities are missing or not presented in sufficient detail to be evaluated as a full system.

**COMPONENTS (Sections 5.0, 6.0 and 7.0)**

**Addition to Participating Municipalities' Diversion Programs (Local 3Rs Programs) (Section 5.3)**



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These submissions include ideas and/or assistance for improving the existing municipal diversion programs concentrating on reduction, source separation, collection and depots and drop off centres. These ideas are primarily producer related and would be carried out before the waste is received for processing or disposal.

**Processing (Sections 5.4 and 5.5)**

These components include all diversion facilities which handle waste after it has been delivered to the municipality, namely Composting and Material Recovery Facilities (MRFs).

**Materials Recovery Facilities (Section 5.4)**

In the waste management industry MRF can be defined in many ways, however, for the purpose of this report "MRF" shall include:

- Mechanical Recovery (Mixed MSW) - Processes were proposed which accept mixed solid waste (MSW) as the feedstock into the plant. In most cases, before entering the process, Blue Box materials have been removed.

- Mechanical Recovery (Source-Separated) - Processes which allow for accept source separated commingled recyclables (i.e. Blue Box materials).

- Mechanical Recovery (One Material) - Processes which accept specific materials only, such as drywall, wood, tires, etc.

**Composting (Section 5.5)**

The organic products derived from MRF processing can be composted to further reduce the volume of waste and/or produce a marketable product. In addition, composting of source separated waste such as yard waste can occur.

**Disposal Facilities Components (Section 6.0)**

These components include landfill, incineration and energy from waste facilities as well as the production of refuse-derived fuel and other less conventional disposal methods. Section 6.0 has been subdivided in the report as follows:



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**Refuse-Derived Fuel (RDF) (Section 6.1)**
Includes the production of a fuel in the form of a solid or gas which can subsequently be used in a boiler or incinerator.

**Energy from Waste (EFW) (Section 6.2)**
Represents an incineration system including some method of recovering energy, in the form of electricity or steam, from the thermal destruction of waste.

**Wet Oxidation (Section 6.3)**
Is the oxidation of waste by treating a slurry in water with air or oxygen. A residue of filterable solids requiring disposal is produced.

**Volume Reduction (Section 6.4)**
Includes some form of compaction, compression or shredding of waste which greatly reduces the volume of waste, but does not change the weight significantly.

**Pyrolytic (Section 6.5)**
Processes which break down waste by heating the waste to high temperature in the absence of oxygen, producing a potentially useful "char" as well as fuel gases and oils.

**Landfill (Section 6.6)**
(Land Only) - The EOI provided information on land available for landfill purposes with no other components or facilities proposed.
Landfill (Operation) - In addition to available land, the EOI indicated an intent to provide a landfill operation.

**Other (Section 7.0)**
This category was provided for any other component or facility which had not been included in the preceding sections. For the purposes of this report it has been subdivided into the following:

**Transportation to Processing/Disposal Facilities (Section 7.1)**
Includes transportation from receiving facilities to the processing or disposal facilities.



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**Research Facilities and Demonstration Projects (Section 7.2)**
These EOIs include research facilities or demonstration projects required to advance the development of the solid waste management system.

**Conceptual Ideas (Section 7.2)**
EOIs proposing nonconventional concepts to the Canadian waste management industry.

**Consulting Services (Section 7.5)**
EOIs which include the supply of technical and/or financial assistance at various stages of the project.



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## 3.2 SUMMARY OF EOIs RECEIVED (see Table 3.1)

### SYSTEMS

#### Complete Systems

In total, 16 respondents claimed to be providing a full system. Six provided adequate information for at least a general evaluation as a system. The remaining ten were missing a key component(s) and were categorized as partial systems.

#### Partial Systems

While claiming to provide a complete system, the level of detail of information received from this group of ten varied widely. Some respondents proposed to handle, only, a large portion of the total waste stream.

### COMPONENTS

#### Addition to Participating Municipalities' Diversion Programs

Various suggestions and ideas on how 3Rs programs could be improved or implemented were provided by 62 respondents. A noteworthy item was the suggested replacement of the Blue Box program with a wet/dry source separation system.

#### Processing Facilities

Responses were divided into 51 Mechanical Recovery Facilities and 32 Composting Facilities. In approximately 40% of the mechanical recovery responses, composting followed the MRF.

#### Mechanical Recovery

- Group 1 Mechanical Recovery (Mixed MSW) - For 23 respondents, the mechanical recovery processes accepted mixed MSW. This group was further subdivided into:
  - Group 1(a) - Three MRFs which accept wastes separated into a wet stream and a dry stream by the Wet/Dry Collection System.
  - Group 1(b) - Eighteen MRFs which accept unseparated mixed waste after the Blue Box materials have been removed.



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- Group 1(c) - Two MRFs which accept mixed wastes without any source separation by either Wet/Dry or Blue Box collection systems.

- Group 2 Mechanical Recovery (Source Separated) - Seven respondents stated an ability or preference for handling source-separated recyclable waste. This category includes processes which are designed to recover specific commingled groups of materials, such as bottles, cans, mixed paper and construction/demolition wastes.

- Group 3 Mechanical Recovery (One Material) - Thirteen respondents indicated a desire to recover one specific material, such as drywall, wood or specific construction/demolition wastes, mixed plastics, tires and food wastes.

Another 15 EOIs are integral parts of disposal and composting facilities but also recover a small percent of materials and are identified as such.

Please note that the following EOIs proposed more than one type of MRF facility:

EOI #72 proposed Groups 1(b), 2 and 3 MRFs
EOIs #25, 58 and 67 proposed Groups 1(b) and 3 MRFs
EOI #7 proposed Groups 1(c) and 3 MRFs
EOI #42 proposed Groups 2 and 3 MRFs

## Composting

A total of 33 EOIs offered composting as a method of diverting the organic fraction of residential/commercial/industrial and construction and demolition waste from disposal. Of the 33 composting EOIs received, 20 EOIs were proposed in conjunction with Material Recovery Facilities (MRFs). Twelve other EOIs use source separated organic, such as yard wastes, and mixed residential waste as a feedstock.

## Disposal Facilities

### Refuse-Derived Fuel

A total of 15 respondents proposed some form of RDF which would be sold to incineration plants as a substitute for coal or unprocessed waste.



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**Energy from Waste**

Seventeen respondents included EFW components in their submissions.

**Wet Oxidation**

One respondent proposed a wet oxidation process for handling waste.

**Volume Reduction**

Four respondents offered systems for reducing the volume of processed or unprocessed waste. In some cases, the compressed product is useful as RDF or building materials.

**Pyrolysis**

Four respondents offered pyrolitic processes.

**Landfill and Landfill Operations**

Of the 86 respondents, 22 respondents referenced thirty-six sites. Sixteen separate sites were specifically identified by location, while the remaining sites were only referred to in general terms.

## Other

**Transportation to Processing/Disposal Facilities**

Thirteen respondents described changes to existing GTA transportation systems in their proposals including shipping by rail and water.

**Conceptual Ideas**

Eleven respondents offered new or conceptual only systems.

**Research Facilities and Demonstration Projects**

Fifteen EOIs discuss locations and information relating to R & D centres, demonstration projects, monitoring of waste management operations and research funding.

**Consulting Services**

Seven respondents offered consulting services.



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## 3.3 LEVEL OF DETAIL

The level of detail provided by each EOI varied from a general expression of interest to submit a component to providing a relatively comprehensive description of a long-term system. Some of the information could not be provided due to confidentiality with respect to site negotiations or the preliminary nature of site investigations. More specific information on waste quantities and composition on the basis of the best available information will be required for the RFPs to provide a common base for the respondents.

A clarification request was issued to more accurately determine the level of diversion; tonnage and waste stream to be processed; recovered materials and markets; degree to which the process is proven in existing installations; and level of North American approvals relating to the process. Seventy-one respondents provided additional detail in the format requested. This allowed a more thorough evaluation of the proposed facilities.

**The EOIs did represent a successful identification of available alternatives and an understanding of the capabilities and technologies available for the waste recovery and disposal components. In many cases, the description of a particular component was very thorough. However, due to the lack of siting details, an evaluation of systems and components as described in the REOI was not possible. Therefore, the evaluation was revised as described in Section 2.0.**



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## 3.4 ADDITIONAL SOURCES OF INFORMATION

In addition to the experience of the Technical Committee and consultants, the following sources of information were utilized in the analysis of the EOIs:

- Gershman, Brickner and Bratton Inc., Falls Church, Virginia a consulting firm specializing in waste management, was retained to provide information on existing MRF and composting facilities in the USA which were provided as references in the EOIs.
- The MOE, Metro and the Regions provided information which they had obtained on processes and technologies.
- The United States Environmental Protection Agency (U.S. EPA) and Environment Canada were also contacted as feasible central repositories of information on new technologies in the waste management fields. Unfortunately, only limited materials were available.
- The APWA kindly supplied some information.
- Regional Waste Management Plans
- Periodicals and Journals.
- National Solid Waste Management Assoc. Periodicals and Newsletters.
- 1990-91 Materials Recovery and Recycling Yearbook - Directory and Guide, Governmental Advisory Associates Inc.
- 1988-89 Resource Recovery Yearbook - Directory and Guide, Governmental Advisory Associates Inc.
- Making a Molehill out of a Mountain, Toronto Home Builders Association, 1990.



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TABLE 3.1

SUMMARY OF EOI CATEGORIES

| | | 4.0 SYSTEMS | | COMPONENTS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Processing | | 6.0 Disposal Facilities | | | | | | | 7.0 Other | | | | |
| Co. No. | Company Name | 4.1 Complete System | 4.2 Partial System | 5.3 Additions to Region | 5.4 Mech. Recov. | 5.5 Com-post | 6.1 RDF | 6.2 EFW | 6.3 Wet Oxid. | 6.4 Vol. Red. | 6.5 Pyrol | 6.6 Landfill Land | 6.6 Landfill Ops. | 7.1 Trans | 7.2 R&D Proj. | 7.2 Conc. Ideas | 7.5 Cons. Serv. |
| 1 | Lamarche McG | | | | D | D | | | | | | | F | | | | |
| 2 | Westinghouse | | | 3Rs | D | | | F | | | | | | | | | |
| 3 | Adv. Ecology | | | 3Rs | D | D | | | | | | | | | | | |
| 4 | Dynavest Int. | | O | | D | | R | | | | R | | | | | | |
| 5 | St. Lawrence | | | 3Rs | D | | F | | | | | | F | | | | |
| 6 | Buhler-Miag | | | 3Rs | D | D | F | | | | | | | | R | | |
| 7 | Cogenesis | | O | | D | D | F | | | | R | | | | | R | |
| 8 | Lavalin | | | | | | | | | | | | | | R | | O |
| 9 | Foster Wheeler | | O | 3Rs | D | D | | F | | | | | | D | | | |
| 10 | NSP Invest. | | | | | | | | | | | F | | | | | |
| 11 | Proctor Gamble | | | 3Rs | | D | | | | | | | | | R | | |
| 12 | Desautels & D. | | | 3Rs | D | | | | | | | | | | | | |
| 13 | Dynaforce W.R. | | | 3Rs | | | | | | R | | | | | | | |
| 14 | MacLaren Eng. | | | | | | | | | | | | | | | | O |

Note: EOIs indicated as F,D or R will be subject to additional screening and public input prior to being asked to submit a proposal.

O = See component evaluation, 3Rs = Submitted to 3Rs F = Full RFP, D = Demonstration RFP, R = Research

U = Unacceptable option, U* = Insufficient Information to Evaluate

TABLE 3.1

SUMMARY OF EOI CATEGORIES

| | | 4.0 SYSTEMS | | COMPONENTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Processing | | 6.0 Disposal Facilities | | | | | | | 7.0 Other | | | |
| Co. No. | Company Name | 4.1 Complete System | 4.2 Partial System | 5.3 Additions to Region | 5.4 Mech. Recov. | 5.5 Com-post | 6.1 RDF | 6.2 EFW | 6.3 Wet Oxid. | 6.4 Vol. Red. | 6.5 Pyrol | 6.6 Landfill Land | 6.6 Landfill Ops. | 7.1 Trans | 7.2 R&D Proj. | 7.2 Conc. Ideas | 7.5 Cons. Serv. |
| 15 | Expocrete Ltd | | | 3Rs | D | D | | | | | | | | | | | |
| 16 | Armbro Mat'ls | | | 3Rs | | | | | | | | | F | | | | |
| 17 | Waste Dist. | | | 3Rs | D | | | | | | R | | | | | | |
| 18 | WPF Corp. BLI | | | | D | D | | | | | | | | | | | |
| 19 | Kenox Corp | | | | D | | | | R | | | | | | | | |
| 20 | See-Bah W E T | | O | | | | | U* | | | | | | R | U* | U* | |
| 21 | Round-Up W P | | | 3Rs | | D | | | | | | | | D | | | |
| 22 | Nera Bioenergy | | | 3Rs | D | D | | | | | | | | | | R | |
| 23 | Swedish Trade | | | 3Rs | | | | | | | | | | | | | O |
| 24 | Env. Disposal | | | 3Rs | D | | R | | | | | | | | | | |
| 25 | Kilborn Ltd. | | | 3Rs | D | D | F | | | | | | | | | | |
| 26 | Igloo Recyc. | | | 3Rs | D | | | | | | | | | D | | | |
| 27 | Airite Env. | | | 3Rs | | D | | | | | | | | | | | |
| 28 | Super'r-Crawf. | | | | | | | | | | | F | | | | | |

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| | | | | | Processing | | 6.0 Disposal Facilities | | | | | | | 7.0 Other | | | |
| Co. No. | Company Name | 4.1 Complete System | 4.2 Partial System | 5.3 Additions to Region | 5.4 Mech. Recov. | 5.5 Com-post | 6.1 RDF | 6.2 EFW | 6.3 Wet Oxid. | 6.4 Vol. Red. | 6.5 Pyrol | 6.6 Landfill Land | 6.6 Landfill Ops. | 7.1 Trans | 7.2 R&D Proj. | 7.2 Conc. Ideas | 7.5 Cons. Serv. |
| 29 | Encomp Ltd. | | | | D | D | | | | | | | | | | | |
| 30 | Compost Man. | | | 3Rs | | D | | | | | | | | | | | |
| 31 | Reuter | | O | 3Rs | D | D | F | | | | | | | D | | | |
| 32 | Recomp Inc. | | | 3Rs | D | D | | | | | | | | | | | |
| 33 | TransCan Pipe | | | 3Rs | | | | | | | | | | | R | | |
| 34 | Notre Devel. | | | 3Rs | D | D | | | | | | | F | | R | | |
| 35 | Enviromax | | O | 3Rs | U* | | | U* | | | | | F | | | | |
| 36 | 808106 Ont | | | | D | | | F | | | | | | | | | |
| 37 | Wood Waste | | | 3Rs | D | | | | | | | | | | | | |
| 38 | Redipac Recyc. | | | 3Rs | D | D | | | | | | | | | R | | |
| 39 | SNC Inc. | | | 3Rs | | | | | | | | | | | | | O |
| 40 | Crang & Boake | | | 3Rs | | | | F | | | | | | | | | |
| 41 | I-S-E Sales | | | 3Rs | | | | | | | | | | | | | |
| 42 | Browning F.I. | | O | 3Rs | D | | | | | | | | F | | | | O |

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| | | 4.0 SYSTEMS | | COMPONENTS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Processing | | 6.0 Disposal Facilities | | | | | | | 7.0 Other | | | | |
| Co. No. | Company Name | 4.1 Complete System | 4.2 Partial System | 5.3 Additions to Region | 5.4 Mech. Recov. | 5.5 Com-post | 6.1 RDF | 6.2 EFW | 6.3 Wet Oxid. | 6.4 Vol. Red. | 6.5 Pyrol | 6.6 Landfill Land | 6.6 Landfill Ops. | 7.1 Trans | 7.2 R&D Proj. | 7.2 Conc. Ideas | 7.5 Cons. Serv. |
| 43 | Stinnes Enerco | | | 3Rs | | | | F | | | | | | | | | |
| 44 | Trican Energy | | | 3Rs | D | D | | | | | | | | | | R | |
| 45 | Wastestreams | | | 3Rs | D | | | | | | | | | | | R | |
| 46 | Agra Indus. | | | 3Rs | D | | | | | | | | F | | | | |
| 47 | Nelson Agg. | | | | | | | | | | | | F | F | R | R | |
| 48 | Equity Waste | O | | 3Rs | D | D | | | | | | | F | | | | |
| 49 | Steetly Quarry | | | | | | | | | R | | | | | | R | |
| 50 | Alternative | O | | 3Rs | D | | | | | | | | F | | R | | |
| 51 | WMI Waste | O | | 3Rs | D | D | F | F | | | | | | | | | |
| 52 | ONTC see #53 | | | | | | | | | | | | F | F | | | |
| 53 | ONTC | O | | O | D | D | F | F | | | | | | | | | |
| 54 | ONTC see #53 | | | | | | | | | | | | | D | | | |
| 55 | Dual Environ. | | | 3Rs | D | | | | | | | | | | | | |
| 56 | Chasson Pall. | | | 3Rs | D | | | | | | | | | | | | |

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| Co. No. | Company Name | 4.0 SYSTEMS | | COMPONENTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Processing | | 6.0 Disposal Facilities | | | | | | | 7.0 Other | | | |
| | | 4.1 Complete System | 4.2 Partial System | 5.3 Additions to Region | 5.4 Mech. Recov. | 5.5 Com-post | 6.1 RDF | 6.2 EFW | 6.3 Wet Oxid. | 6.4 Vol. Red. | 6.5 Pyrol | 6.6 Landfill Land | 6.6 Landfill Ops. | 7.1 Trans | 7.2 R&D Proj. | 7.2 Conc. Ideas | 7.5 Cons. Serv. |
| 57 | Trow + D & M | | | 3Rs | | | | | | | | | | | | | O |
| 58 | Weldex Co. | | | | D | D | F | F | | | | | | | R | | |
| 59 | Agripost | | | 3Rs | | D | | | | | | | | | | | |
| 60 | Enviro-Watch | | | 3Rs | | | | | | | | | | D | | | |
| 61 | CN Rail | | | 3Rs | D | | | | | | | | | F | | | |
| 62 | CP Rail | | | 3Rs | | | | | | | | | | F | | | |
| 63 | Royaledge | | | 3Rs | D | D | F | | | | | | | | | | |
| 64 | Wastech | | | | D | | | | | | R | | | | | | |
| 65a | Otto-Canada | | O | 3Rs | U* | U* | | U* | | | | | F | U* | | | |
| 65b | Halton-Otto | | | 3Rs | D | | | | | | | | | | | | |
| 66 | Pattison | | O | 3Rs | D | | | R | | | | | | | | R | |
| 67 | Laidlaw | O | | 3Rs | D | D | F | | | | | | F | | | | |
| 68 | ICG Co-Gen | | | | D | | | F | | | | | | | | | |
| 69 | MSW Recyc. | | | 3Rs | D | D | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Processing | | 6.0 Disposal Facilities | | | | | | | 7.0 Other | | | |
| Co. No. | Company Name | 4.1 Complete System | 4.2 Partial System | 5.3 Additions to Region | 5.4 Mech. Recov. | 5.5 Com-post | 6.1 RDF | 6.2 EFW | 6.3 Wet Oxid. | 6.4 Vol. Red. | 6.5 Pyrol | 6.6 Landfill Land | 6.6 Landfill Ops. | 7.1 Trans | 7.2 R&D Proj. | 7.2 Conc. Ideas | 7.5 Cons. Serv. |
| 70 | Faruk Fattah | | | 3Rs | | D | R | | | R | | | F | | R | | |
| 71 | Env. Air Struc. | | | 3Rs | D | D | F | | | R | | | | | | R | |
| 72 | Markham/Miller | | O | 3Rs | D | | | | | | | | F | D | R | | |
| 73 | Surety Env. | O | | 3Rs | D | | F | F | | | | | F | R | | | |
| 74 | Bedminster Bio | | | 3Rs | | D | | | | | | | | | R | | |
| 75 | ONTC see #53 | | | | | | | | | | | | | | | | |
| 76 | Muscillo Trans. | | | 3Rs | D | D | | F | | | | | | | | | |
| 77 | Montenay Inc. | | | 3Rs | D | D | | F | | | | | | | R | | |
| 78 | Ogden, Martin | | | 3Rs | D | | | F | | | | | | | | | |
| 79 | Ortech Int. | | | 3Rs | | | | | | | | | | | R | | |
| 80 | Paul Temelini | | | | | | | | | | | F | | | | | |
| 81 | Methon Energy | | | | | | | | | | | | R | | | R | |
| 82 | Chivers-Wilson | | | | | | | | | | | | | | | U | |
| 83 | Renutech Corp. | | | 3Rs | | | | | | | | | | | | R | |

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TABLE 3.1

SUMMARY OF EOI CATEGORIES

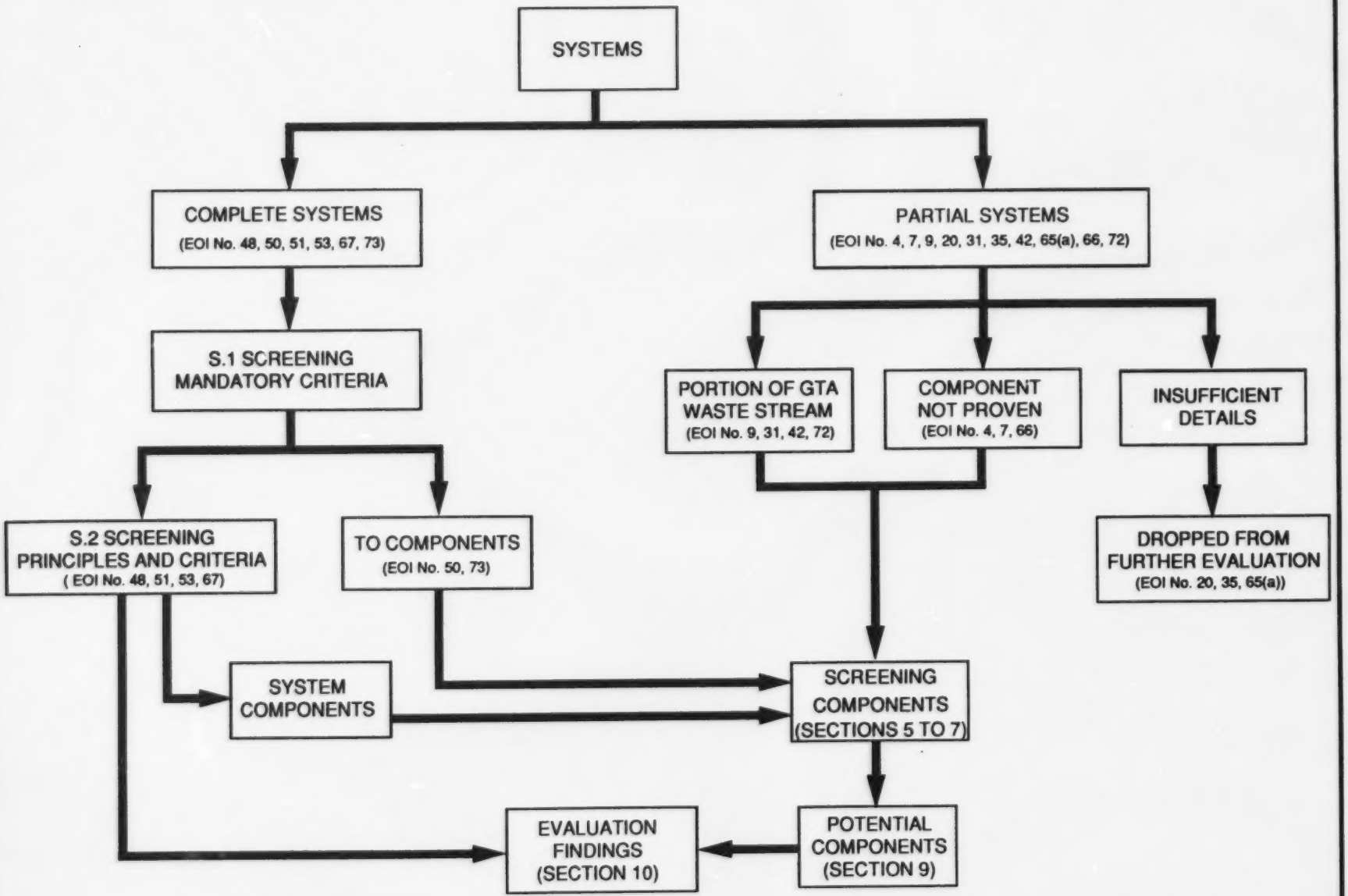
| Co. No. | Company Name | 4.0 SYSTEMS | | COMPONENTS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Processing | | 6.0 Disposal Facilities | | | | | | | 7.0 Other | | | |
| | | 4.1 Complete System | 4.2 Partial System | 5.3 Additions to Region | 5.4 Mech. Recov. | 5.5 Com-post | 6.1 RDF | 6.2 EFW | 6.3 Wet Oxid. | 6.4 Vol. Red. | 6.5 Pyrol | 6.6 Landfill Land | 6.6 Landfill Ops. | 7.1 Trans | 7.2 R&D Proj. | 7.2 Conc. Ideas | 7.5 Cons. Serv. |
| 84 | W.Hutchinson | | | | | | | | | | | F | | | | | |
| 85 | Stone & Webst. | | | 3Rs | | | | | | | | | | | | | O |
| 86 | Standard Agg. | | | | | | | | | | | F | | | | | |
| | TOTALS | 6 | 10 | 62 | 51 | 33 | 15 | 17 | 1 | 4 | 4 | 5 | 17 | 14 | 15 | 12 | 7 |

Note: EOIs indicated as F,D or R will be subject to additional screening and public input prior to being asked to submit a proposal.

O = See component evaluation, 3Rs = Submitted to 3Rs F = Full RFP, D = Demonstration RFP, R = Research

U = Unacceptable option, U* = Insufficient Information to Evaluate

**FIGURE 4.1: SYSTEMS**



## 4.0 SYSTEMS

This section describes key details of the complete systems and partial systems submitted. As described in Section 3.1, systems were divided into two groups. The first group included six respondents who provided enough information to be evaluated as a complete system. The remaining 10 respondents were categorized as partial systems. Complete systems are screened in Step S.1 - Mandatory Criteria and the Initial List of Components, and Step S.2 Principles and Criteria. Partial systems are screened in Step S.1 only.

## 4.1 COMPLETE SYSTEMS

The following provides a description of the six complete systems submitted. The description relates to the Mandatory Criteria and Initial List of Components as described in Table 2.1 of Section 2 and summarized in Table 4.1 at the end of this section.

**#48 Equity Waste Management**

Diversion

- 40% diversion of total GTA waste to be attained by 1992 largely through expansion of 3Rs to all sectors and legislation of packaging, returnables and source separation (by others)
- Grey Box fine office paper recycling is proposed for school boards, institutions, agencies, universities and colleges, hospitals, municipal and provincial buildings
- total diversion of 60% by 1996 through implementation of the Mitsui materials recovery system which is discussed in detail in Section 5.4) and a vermicomposting operation
- propose to handle all GTA waste by building three facilities rated at 4700 TPD
- separation and handling of tires, HHW, Hospital and other special wastes is necessary to meet diversion targets



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Proven Success

- the 40% diversion rate in 1992 is largely by others
- information on success of the Grey Box recycling system is not provided
- the Mitsui system is operational in at least one 1500 TPD plant in Tokyo, Japan; others are claimed but not identified
- use of new generation European technology which combines screening and air classification systems to separate MSW into streams at the front end of the process is to be combined with the Mitsui process
- Equity will modify basic Mitsui process to suit GTA waste composition
- system will not include waste shredding and incineration

Initial List of Components (see Table 4.1 for description of (a) to (i))

(a) the respondent will assist SWISC in 3Rs diversion programs pending establishment of the complete long-term system

(b) waste will be received at existing transfer stations which will be upgraded for removal of large objects, tires, furniture, etc.
- depots for some source separated items will also be placed at transfer stations
- waste is then hauled to processing facilities

(c) main receiving facilities will be the processing facilities to be located at existing GTA facilities or sites such as the Peel EFW site, closed landfills, existing municipal transfer stations, existing recycling plants and private transfer stations

(d) rail haul is proposed for transportation to remote disposal sites
- British and Netherlands systems are cited as possible systems
- conventional truck transportation proposed for travel to processing facilities in the GTA

(e) as discussed in Proven Success section above, a modified Mitsui processing system is proposed employing European advancements

(f) landfills are proposed near the town of Ignace and Kirkland Lake (Adams Mine)
- an advertising effort was conducted to locate receptive communities
- in addition to Ignace and Kirkland Lake, Equity claims to be negotiating with others



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- in addition to conventional landfill, non-putrescible unrecoverable wastes including construction and demolition waste are to be monofilled in an inert landfill so they may be extracted for later use
- a gas generation cell landfill for putrescible wastes is proposed for the production of methane to be used for electrical power generation
- composting of sewage sludge

(g) a specification for an R & D centre is provided
- an independent entity should operate the facility

(h) the idea of mining old landfill sites is proposed but not discussed in detail

(i) a number of short term 3Rs ideas are proposed as described in Diversion above



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**#50 Alternative Environment**

Diversion

- 50% diversion is to be achieved by others
- the main component proposed (a compaction, encapsulation system that produces blocks of waste) does not divert any waste, other than some leachate from disposal and limited front end sorting for metals recovery (see (e) below)
- for the purpose of this evaluation it is considered as a disposal component
- generic ideas only, are given
- when blocks are used for land reclamation, respondent claims that this is diversion from disposal
- if this form of diversion is acceptable an additional 40% can be diverted leaving only 10% for disposal

Proven Success

- the respondent claims that the Tezuka Kosan system has been employed extensively in Japan for land reclamation projects, largely to reclaim land from the ocean
- no North American installations exist
- no testing on the final product, such as leachate and freeze/thaw testing on the blocks has been conducted in North America: no specific information was provided to the request for additional information

Initial List of Components

(a) a generic description of enhanced source separation is provided but responsibility for the program is by others

(b)(c) receiving points and processing/receiving facilities will be located at existing transfer stations and existing landfills

- for outside of GTA processing facilities, transfer stations would be established at each of the five municipalities (no details)

(d) conventional truck/trailer transportation as well as rail for locations outside of the GTA are proposed (no details)



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(e) limited separation and recovery of metals and unprocessible waste occurs at front end of Tezuka system

(f) Tezuka Kosan triple compression compaction system reduces volume of waste by one-fifth to one-eighth
- leachate is squeezed from the 1 ton cubic yard block and treated by conventional methods
- the block is then encapsulated in vinyl and wire mesh to produce a stable, leachate free product which can be disposed of or used for land reclamation
- the block can be further encapsulated in concrete and reused as a building material
- remaining 10% of non-processible waste must be landfilled
- no specific landfill locations were provided

(g) respondent offers to participate in R&D facilities which will be funded by tipping fees

(h) no other components offered

(i) claim that others can achieve 50% diversion in short term: no specific details were provided



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**#51 WMI Waste Management of Canada/Wheelabrator Technologies**

Diversion

- claims 52% diversion of total waste stream is achievable through the wet/dry collection and processing system for residential and commercial/industrial waste
- separate yard waste collection and composting for residential and commercial/industrial and separate construction and demolition collection and recycling are proposed
- dry waste only is processed through the MRF
- wet waste is processed through the Brini system to produce RDF for the EFW plant

Proven Success

- MRF system is not specified
- Brini is an experienced waste processing system for wet waste (see Section 5.4)
- Wheelabrator is a proven EFW facility contractor
- experienced as landfill operator (100 active landfills)
- experienced in waste collection and transportation systems

Initial List of Components

(a) proposes replacement of Blue Box with the Wet/Dry collection system, but will consider alternatives

(b)(c) receiving points and facilities will be located at existing transfer stations and will be integrated with the MRF facility which will also be sited at existing transfer stations, landfills and industrial areas near waste generation

(d) conventional truck transportation is proposed

(e) the MRF (not specified) will process dry waste from the residential, commercial/industrial and construction and demolition waste streams

- Brini system will process wet waste into RDF for incineration
- a yard waste windrow composting system is proposed (no details)
- construction and demolition includes a portable crushing/screening system
- tire shedding module also proposed
- batteries must be source separated



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(f) Wheelabrator EFW plant is proposed
- landfill for remaining ash must be monofilled and double lined detection/collection installed
- status of site acquisition precludes disclosure of locations
- EFW reduces waste quantity for disposal to landfill by an additional 25%

(g) funding at GTA universities is offered as well as individual scholarships
- WMI has existing Environmental Monitoring Laboratory in Geneva, Illinois

(h) no other components offered

(i) no short term systems proposed



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## #53 Ontario Northland Transportation Commission

Diversion

- MRF processing facilities to achieve 16% diversion initially, combined with Blue Box to produce 20% by 1992
- improved efficiency will produce 26% by 1996
- enhanced source separation and composting will create 50% diversion by 2000
- 4000 - 8000 TPD MRF facilities proposed to assist in meeting the target
- RDF and EFW (4000 TPD) are also proposed

Proven Success

- CAL recovery systems proposes to base the design of their MRF system on other proven facilities and equipment experience
- experience of CAL is not extensive
- rail transportation of waste is proven on 1500 to 2000 TPD operations in North America and Europe
- EFW is a proven technology (by Stinnes Enerco)

Initial List of Components

(a) due to the remote location of the facilities it is assumed that all municipal diversion programs will be the responsibility of others
- no indication of additional municipal programs are given

(b)(c) existing transfer stations would continue to operate as intermediate bulking stations, followed by transportation to proposed rail terminals
- transfer station equipment would be replaced to accommodate rail transportation format
- alternatively waste would be hauled directly to the rail terminals sited in GTA (at existing marshalling yards)
- a northern rail terminal is required near the proposed waste processing facilities

(d) rail transportation of total GTA processed and unprocessed waste for disposal
- several rail transportation formats are considered (see Section 7.1)

(e) CAL recovery system MRF to recover materials to initially achieve 16% diversion and produce RDF (4000 - 8000 TPD) to be located in Kirkland Lake
- composting also to be designed by CAL to achieve an additional 35% diversion



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(f) EFW proposed by Stinnes Enerco (4000 TPD) in Kapuskasing, Ontario

- 3 alternatives for landfill locations are proposed:
  (1) Kirkland Lake (Adams Mine); Notre Development Corp.
  (2) Adjacent to ONR line between New Liskeard and Kirkland; Lake Northern Opportunities Inc.
  (3) Adjacent to ONR line on property owned by ONTC/Crown (if required)

(g) facilities are to be integrated at the Adams Mine site with secondary industries

(h) no other components offered

(i) no short term solution proposed



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**#67 Laidlaw Waste Systems**

Diversion

- public sector Blue Box enhancement, white goods recycling, municipal leaf composting, backyard composting, diversion of construction and demolition wastes and sewage sludge and ash
- private sector, OCC, wood waste, drywall, office paper and organics recycling
- public and private sector combined = 24% (1995)
- assist in HHW depots enhancement = 1%
- materials recovery facility = 12%
- composting (Sorain/DRANCO) = 31%

  By the Year 2000 68%

Proven Success

- Sorain-Cecchini has a great deal of MRF/composting experience in Europe, particularly in Italy. At least five facilities were greater than 600 TPD, currently involved in 1650 TPD MRF/EFW plant in San Marcos, California
- operating data on Sorain or DRANCO composting was not provided
- Laidlaw has extensive landfill experience

Initial List of Components

(a) a number of initiatives were proposed to expand blue box (see Diversion above) and increase both public and private sector involvement

(b)(c) in general, existing transfer stations will remain, but some waste will be hauled directly to the five proposed processing facilities located throughout the regions

(d) conventional trucking to transfer stations and processing plants
- transportation to disposal sites will be by truck or rail depending on locations

(e) up to 7 separate processing and composting facilities are proposed, each with multiple process lines for flexibility of throughput
- MRF to recover plastic film, paper, aluminum, ferrous and a mixed organic fraction for composting
- production of RDF is also possible
- the Sorain composting process involves use of an aerobic digester, which claims to sterilize the compost and produces no odours; the compost cycle lasts 28 days



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- the DRANCO (Dry Anaerobic Composting) system is also offered; fermentation produces a biogas for EFW and requires a shorter compost cycle

(f) three potential landfills are offered in Newcastle (7.5 million tonnes), Ottawa (3.4 million tonnes) and the Township of Warwick, Ontario (7.0 million tonnes)

- the communities have not apparently been receptive to the proposed expansion of these existing landfills

(g) would form a research division in the company to assess and improve the efficiency of the operations and to test new technologies

- would like existing research and academic institutions involved

(h) expansion of HHW depot system was proposed

(i) implementation of several 3Rs initiatives (identified in Diversion above) could be accomplished in the short term



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**#73 Surety Environmental Inc.**

Diversion

- assumes that 10% diversion by Blue Box etc. can be achieved by others
- processing by MRF (not identified) will remove an additional 15%
- 10% non-processible will go to landfill in GTA
- remaining 65% is to be pellatized or baled as RDF and shipped by water to the Maritimes

Proven Success

- EFW is assumed to be proven (no details)
- MRF (no details) 15% diversion appears attainable
- shipping 65% of total GTA waste by water is not a proven technology: question of what is done during the winter months, when St. Lawrence Seaway is closed, was not addressed

Initial List of Components

(a) by others

(b)(c) Toronto Port Transfer station (no details)

(d) by water to the Maritimes (see proven above)

(e) unspecified MRF facility which largely produces RDF

(f) EFW (unspecified) in Maritimes

(g) ash to be landfilled in Long Harbour, Newfoundland
rendered inert and benign prior to being landfilled, similar to the Swan Hills, Alberta treatment facility

(h) no other components offered

(i) no short term systems included



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Table 4.1 Summary of Systems Screening, Mandatory Criteria (Step S.1)

| | EOI #48 (Equity Waste Mge) (Comprehensive Submission) | EOI #50 (Alternative Environment) (General) | EOI #51 (WMI/Wheelabrator) (Comprehensive Submission) | EOI #53 (Ont. Northland) (Comprehensive Submission) | EOI #67 (Laidlaw) (Comprehensive Submission) | EOI #73 (Surety Environment) (General) |
|---|---|---|---|---|---|---|
| **MANDATORY CRITERIA** | | | | | | |
| 1. Achieve 50% Diversion of Waste | . Claim 60% by 1996 | . By others prior to compression/encapsulation | . Claim 52% - switch to Wet/Dry Collection & Process | . Claim 51% for 20%-40% of total GTA waste stream | . Claim 68% (25% by others) | . Claim 25% |
| 2. Proven Success of System at Scale Suitable for GTA | . Comb. PROVEN European technology with Japanese | . PROVEN in Japan for land reclamation from ocean | . Claim MRF PROVEN<br>. EFW PROVEN | . MRF and Rail technologies subject to confirmation | . MRF PROVEN Internationally | . NO (not enough detail) |
| **INITIAL LIST OF COMPONENTS** | | | | | | |
| (a) Addition to Participating Municipal Diversion Programs | (a) Enhance Blue-Box Grey Box (fine paper) | (a) Generic ideas only | (a) Replace present with Wet/Dry (will bid alt's) | (a) Enhanced Blue Box - By other | (a) Enhance Blue Box | (a) NO - By others (Blue Box) |
| (b) Receiving Point(s) for Waste from Municipalities | (b) Upgrade existing transfer stations to include initial source separation | (b) Utilize existing transfer or landfill sites | (b) Direct haul to MRF's sited at transfer stations | (b) At existing GTA transfer stat's & to Rail at existing marshalling yards in GTA | (b) Direct haul to MRFs or existing transfer stations | (b) Tor. Harbour Front Lands |
| (c) Receiving Facilities | (c) At Processing Facilities located at existing transfer stations landfills and municipal lands | (c) Facilities to transfer from truck to rail | (c) MRFs at Transfer Stations existing stations, landfills and industrial areas close to waste generation | (c) Facilities to transfer from truck to rail | (c) MRF Facilities | (c) Recycling/Transfer Station |
| (d) Transportion to Processing & Disposal Facility(ies) | (d) In GTA - Truck<br>Out of GTA - Rail | (d) Local - Truck<br>Remote - Rail | (d) Truck | (d) Rail Haul to be tendered (#54; #62 (CP); #61(CN)<br>. CN or CP to North Bay<br>. ONR from North Bay to site | (d) Truck to Processing in GTA<br>Rail to remote disposal | (d) By Water to Maritimes<br>Winter export not addressed |
| (e) Processing Facility(ies) (MRFs, Composting etc.) | (e) Modified Mitsui Vermicomposting | (e) Limited separation of metals at front end of process | (e) Wet/Dry MRF, Composting<br>Const. & Dem. Processing<br>Tire Shredding<br>Alt. RDF production - Brini | (e) MRF<br>Composting | (e) Sorrain Cecchini MRF<br>Sorrain or DRANCO Compost<br>Const. & Dem. Processing<br>Sewage Sludge Composting | (e) MRF to recover 15% and to prepare RDF for shipping |
| (f) Disposal Facility(ies) | (f) Landfill, Ignace, Ont. or Kirkland Lake, Ont.<br>Methane recovery<br>Inert waste to sep. landfill | (f) Tezuka Compression & Encapsulation blocks to landfill, land reclamation or construction | (f) EFW - Wheelabrator<br>Landfill - WMI Design<br>Status of site acquisition precludes disclosure | (f) EFW/RDF - Kapuskasing<br>Landfill - 3 Alt's between Kirkland Lake & New Liskeard<br>Adams Mine - 25 MT | (f) Landfill<br>Newcastle 7.5 MT<br>Ottawa 3.4 MT<br>Warwick 7.0 MT | (f) EFW in Maritimes<br>Landfill in Nfld. |
| (g) Research Facility(ies) and Demonstration Projects | (g) R & D specifications were provided | (g) Univ. Programs, etc. | (g) Funding Universities, etc.<br>In-House Program | (g) To be integrated at MRF and secondary industries | (g) Will form research division of company | (g) Not addressed |
| (h) Other | (h) Mine old/existing sites ? | (h) NIL | (h) NIL | (h) NIL | (h) HHW depots enhanced | (h) Not addressed |
| (i) Short-Term Solutions? | (i) 3R's Interim Strategies to improve diversion | (i) Claim 3R's initiatives can be implemented now | (i) NO | (i) NO | (i) Improve 3Rs | (i) No |

TABLE 4.2

SUMMARY OF SYSTEMS SCREENING, PRINCIPLES AND CRITERIA (STEP S.2)

| PRINCIPLES AND CRITERIA (STEP S.2) | EOI #48 EQUITY | EOI #51 WMI | EOI #53 ONTR | EOI #67 LAIDLAW |
|---|---|---|---|---|
| *Principle 1 - To aim at fulfilling provincial targets for diversion of solid wastes from disposal.* | | | | |
| 1. Additional percentage of wastes diverted | 60% | 52% | 51% | 56% |
| 2. Markets proposed for materials diverted | N | Y | Y | Y |
| 3. Flexibility with respect to future technological and market developments | Y | Y | Y | Y |
| *Principle 2(a) - To consider alternative methods of disposal of residual wastes.* | | | | |
| 1. Landfill | Y | Y | Y | Y |
| 2. Energy from waste | N | Y | Y | N |
| 3. Other environmentally acceptable method | N | N | N | N |
| *Principle 2(b) - System based on proven technology and meets environmental and other approval requirements.* | | | | |
| 1. Use of more advanced alternatives | N | N | N | N |
| 2. Period of time when the proposed system is potentially viable (landfill capacity in years) | 9 * | 20-30 ** | 9 * | 5 *** |
| 3. Flexibility with respect to future technological developments | Y | Y | Y | Y |
| *Principle 3 - Construct an innovative framework for new research and development in the 4Rs.* | | | | |
| 1. New research and development programs | Y | Y | Y | Y |
| 2. Likelihood of results in short term and/or long term | Y | Y | Y | Y |
| *Principle 4 - Locate facilities in receptive communities and maximize industrial development activities.* | | | | |
| 1. Inclusion of a willing and appropriate host community(ies) | Y | N/A | Y | N |
| 2. Industrial development in the host community(ies) | Y | N/A | Y | Y |
| 3. Jobs created in the host community(ies) | Y | N/A | Y | Y |
| 4. Adequate infrastructure in place in host community(ies) | Y | N/A | Y | Y |
| *Principle 5 - Allows for maximum collaboration, best combines efforts and serves as a world class model.* | | | | |
| 1. Flexibility of Respondents to consider collaborative efforts in ownership and operation | Y | N | Y | Y |
| 2. Suitability of preferred alternatives for collaborative efforts | N | Y | N | Y |
| 3. Provision of short-term contingency facilities | Y | N | N | Y |

* Kirkland Lake - Adam's Mine
** No specific site(s) identified
*** Three sites - Newcastle, Warwick, Ottawa

Y - claims to meet criteria
N - does not meet criteria
N/A - information not available

Years of capacity based on landfilling 50% of GTA wastes from 1996 (Table 4.1)

## 4.2 SCREENING OF COMPLETE SYSTEMS

A summary of the results of the Step S1 screening is found in Table 4.1. This step tests the six system EOIs against the Mandatory Criteria and identifies the Initial List of Components.

Achieve 50% Diversion of Waste (Step S.1-1

**System EOIs #50 (Alternative Environment) and #73 (Surety Environmental) do not indicate the ability to achieve 50% diversion of waste specifically within their proposals and are therefore referred to the component evaluation.**

#53 (Ontario Northland) proposes to provide transportation and disposal for the entire GTA waste stream. Processing facilities are proposed in the Kirkland Lake area to divert 51 percent of waste starting with 4,000 TPD facilities and increasing to 8,000 TPD. Although this system will only process 20% to 40% of total GTA wastes, the concept of the remainder being diverted in the GTA (by others) before shipment to the disposal facilities, is acceptable at this time. Therefore, this system is maintained for further analysis.

All other systems, EOI's #48 (Equity), #51 (WMI) and #67 (Laidlaw), satisfy the Step S.1-1 diversion criterion. The actual ability of the various components to achieve this overall diversion is addressed in Section 5.

Proven Success of System at Scale Suitable for GTA (Step S.1-2)

The proven criteria was applied to the major component technologies proposed in each EOI namely:

- Collection Component.
- Transportation Component.
- MRF Component.
- Compost Component
- Disposal Component.



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**Collection Component:** EOIs #48,#53 and #67 all claim to improve or enhance the existing Blue Box system while EOI #51 proposes to replace Blue Box with the European Wet/Dry collection system. It is recognized that neither system has been proven on a scale suitable for the GTA to achieve 50% Diversion, nor has one proven to be superior to the other within the GTA. However the Blue Box is the basis for Ontario's present success in Recycling. **A more detailed description and analysis of the collection systems is provided in Section 5.3.2.**

**Transportation Component:** EOI #51 does not describe the transportation component beyond conventional collection systems by truck. EOI's offering Rail transportation to processing or disposal facilities outside the GTA include EOI's #48, #53 and #67. **Rail transportation of waste is considered to be proven technology as described in Section 7.1.**

**MRF Component:** Among the proposed MSW MRF technologies, various levels of proven success exist. It was found that none of the MRF proprietors demonstrate experience or success at the scale proposed for GTA. **This component is not considered proven at this time and is discussed in more detail in Section 5.4.**

**Compost Component:** EOIs #48, #51, #53 and #67 include composting at various points in their system. In general, backyard composting and larger scale windrow composting, is a proven technology but the ability to compost waste on the GTA scale and the extent to which it is viable at the scale proposed will be governed by quality of end product and marketability. **Further demonstration is required to be acceptable as proven technology for the scale of facilities proposed as discussed in Section 5.5.**

**Disposal Component:** All four system respondents, provide conventional type landfill facilities. EOI #48 proposes a separate landfill for inerts from the processing of construction and demolition waste. EFW facilities are proposed in EOI #51, and #53 and are evaluated in detail in Section 6.2. **Landfill and EFW are considered to be proven disposal components.**

Despite reservations with respect to the ability of the MRF and composting components to meet the proven criterion it was considered important to subject these systems to the S.2 screening.



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SWISC Principles and Criteria (Step S.2)

Table 4.2 summarizes the step S.2 screening performed on these systems, the results are discussed below.

**EOI #48 - Equity Waste Management**

- The respondent proposes to exceed both the provincial diversion targets and achieve 40% by 1992 and 60% by 1996. Markets for the recovered products were not identified.

- An inert landfill was proposed in addition to conventional landfill which will increase the life of the Adams Mine site to greater than 9 years. EFW is not proposed.

- A detailed specification for a Research and Development centre was provided as well as many short term 3Rs suggestions. The concept of mining existing landfills to recover materials and increase landfill capacity was proposed.

- Two potential sites were proposed in receptive communities where industrial development and job creation would be created.Some level of flexibility, relative to collaborative efforts is lost in this proposal, due to the remote location of processing at Igna ce (1680 km) and both processing and disposal facilities at Kirkland Lake, Ontario (585 km).

**EOI #51 - Waste Management Inc. (Wheelabrator)**

- The respondent proposes to achieve 52% diversion rate by incorporation of the Wet/Dry Collection and MRF processing. Marketing capabilities of the recovered materials are claimed.

- R & D would be approached with University funding and WMI's own in-house program.



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- Details on processing and disposal sites were not provided and therefore Principle 4 could not be evaluated, however, 20 to 30 years of disposal capacity was claimed.

- WMI would prefer to own and operate the entire system, however they are willing to negotiate ownership of various components by others. Short Term contingency facilities were not proposed.

**EOI #53 - Ontario Northland Transport Commission**

- Diversion targets will be met with the 4000 - 8000 TPD MRF facilities. The remaining waste must be diverted by others.

- The respondent did not consider alternative disposal methods (Principle 2(a)), or short term contingency facilities. The Adams Mine site, with 9 years disposal capacity, was proposed as the preferred disposal site although other options are available.

- R & D would be integrated into the MRF and secondary industries located near the disposal site.

- Similar to #48, this EOI offers remote processing and disposal facilities in receptive communities which somewhat limits the flexibility for collaborative efforts in operation of the system (Principle 5).

**EOI #67 - Laidlaw**

- 56% Diversion will be achieved through enhanced blue box and MRF processing.

- EFW and other alternative disposal methods are not proposed and presently disposal facilities are not located in receptive communities. Total disposal capacity amounts to only 5 years, but provide for consideration as short-term contingency sites.



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**Summary of Complete Systems S.1 and S.2 Screening**

**EOI's #50 (Alternative Environment) and #73 (Surety Environmental) do not satisfy the Step S.1-1, 50% diversion criterion and therefore are referred into the component evaluation.**

Four of the six systems, EOI's #48 (Equity), #51 (WMI), #53 (Ontario Northland) and #67 (Laidlaw) generally meet the requirements of the S.1 and S.2 screening. However, each contains elements which require additional information and analysis before SWISC could proceed in anticipation that they would provide an acceptable system.

The viability of the MRF components are not proven at a scale suitable for the GTA.

The composting component is considered to be closer to meeting the proven criterion, however significant increases in the scale of existing facilities would be necessary to meet the GTA needs. In addition, the ability to market the product in the residential, municipal or commercial sectors, has still to be demonstrated.

Three of the four systems propose the use of rail transportation to remote processing and disposal facilities. While this component is proven on scales of 2000 TPD for solid waste hauling, a GTA rail haul system could require up to 14,000 TPD (365 day basis, year 2000) of unprocessed waste to be transferred to processing and disposal facilities located in remote locations, assuming no diversion prior to transportation.

It is considered that these EOIs show potential as long term waste management systems. However, based on the information provided it cannot be determined if key components of the system will be viable on the scale suitable for the GTA. The systems are therefore considered further in Section 9.0 Potential System Components, and Section 10.0 Evaluation Findings.



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## 4.3 PARTIAL SYSTEMS

As previously indicated, several respondents expressed an interest in supplying a full system. However, upon further evaluation it was found that either;

a) Insufficient detail was provided to evaluate the EOI as a system; or
b) Critical components proposed by the respondent were not proven beyond Pilot scale; or
c) The respondent expressed interest in diverting a significant portion of the waste stream but not the total GTA waste stream.

To determine if these partial systems might provide a significant portion of a complete system they are described with respect to the initial list of components and evaluated in the S.1 screening process, which is summarized in Table 4.3.

EOI's Providing Insufficient Detail to Evaluate as a System

**#20 See-Bah Waste Elimination Technologies**

Diversion

- no commitment, future studies will determine the attainable diversion

Proven Success

- components are described in conceptual form only
- key component is a pyrolytic type process which is not new however, this process has never been used on a large scale
- claims that a full scale plant was in operation in Brisbane, Australia and California were not supported in detail
- marketability of the final product is not proven

Initial List of Components (see Tables 2.1 and 4.3)

(a) no details
(b)(c) waste would be received at Sault Ste. Marie after transportation by water or rail



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- if the plant is in GTA, existing transfer stations would be used

(d) no details on shipping by water to Sault Ste. Marie

(e) waste is received after initial diversion by others: it is then mixed with clay and extruded into pellet form and processed in a rotary kiln to produce a light weight ceramic aggregate which is claimed to be marketable as an additive for concrete

(f) some excess heat is produced (no details) and could be used as EFW

(g) request funding for a pilot plant

(h) claims that the process will handle waste water treatment sludges

(i) no short term facilities proposed although schedule calls for 1992 start-up

**#35 Enviromax**

Diversion

- total diversion from landfill (including EFW) is estimated to be 88 - 90% of 1.2 million tonnes per year (23% of wastes generated in year 2000)
- no breakdown is given
- diversion to be accomplished by MRF, wood waste recovery, tire processing and oil recovery

Proven Success

- insufficient details were provided to assess

Initial List of Components

(a)(e) no details

(f) propose 4000 TPD EFW plant (no details)
landfill on 125 - 165 acres of a 407 acre site

(g)(i) no details



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**#65(a) Otto - Canada**

Diversion

- claim ability to divert 65% of total waste stream
- diversion achieved by MRF plants for residential and commercial/industrial
- composting plants for source separated food, yard waste, wood
- construction and demolition recovery plants

Proven Success

- system is based on wet/dry collection system, which is not proven in GTA
- only 1 MRF facility named in Borman, West Germany, 135 TPD

Initial List of Components

(a) relies on wet/dry collection system

(b)(i) no details were provided on remaining components

<u>EOI's with Critical Components not Proven at GTA Scale</u>

**#4 Dynavest International**

Diversion

- 15 - 20% diversion of GTA waste obtained from mixed feed stream MRF (to be operated by others)
- remaining waste is processed through a pyrolytic type thermal processor to increase diversion from landfill up to 80 - 85%

Proven Success

- pyrolytic processors are not proven at a large scale
- only one 48 TPD pilot facility exists
- marketability of char is not proven

Initial List of Components

(a) by others

(b)(c) GTA processing facilities, no details



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(d) by others

(e) claims MRF can be incorporated into front end of plant

(f) propose to build 44 to 48, 240 TPD thermal processing plants from 1992 to 2000

(g)(h) no details

(i) claim construction schedule of 8 months

**#7 Cogenesis Corp.**

Diversion

- claim 30% diversion by MRF and 23% diversion by composting of total GTA waste stream
- followed by thermal processing with McMullen Pyrolyser to divert an additional 20 - 40% from landfill
- propose to also process tires, low grade HHW and waste oil

Proven Success

- the MRF is to be built by SPM Resource Recovery Systems who have limited experience, however they claim to use proven European technology and reference 250 TPD plant under construction in Council Bluffs, Iowa which will include an 80 TPD pyrolyser.
- there are no existing McMullen Pyrolysers operating
- marketability of char is not proven

Initial List of Components

(a) by others

(c)(d) no details

(e) MRF by SPM group

(f) McMullen Pyrolyser takes waste after initial diversion by MRF and composting and thermally processes it in pyrolyser to produce a char and combustible gas, seventy-eight, 250 TPD plants are proposed

- claim char and gas is marketable as RDF

(g)(i) no details



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**#66 Pattison Information Inc.**

Diversion

- no commitment to recovery of waste is given, limited separation of ferrous metals and aluminum occurs
- remaining process is thermal/disposal (Neutralysis) but produces an aggregate product, which is claimed to be useful as a construction material; a combustible gas is produced which is excess to that used as a fuel in the process
- claims only 1% of waste goes to landfill

Proven Success

- claims an operating pilot plant in Brisbane, Australia
- process appears to be similar process to EOI #20
- marketability of aggregate unproven

Initial List of Components

(a) by others, encourage removal of HHW

(b)(d) no details

(e) MRF, by others, can be incorporated if required

(f) see description in diversion above

- landfill by others

<u>Respondent Will Divert a Significant Portion of the GTA Waste</u>

**#9 Foster Wheeler**

Diversion

- claim that 27% diversion can be achieved by a combination of source separation and materials recovery including composting
- remaining diversion proposed by a mass burn EFW plant to divert an additional 47% from landfill
- excludes construction and demolition waste



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Proven Success

- MRF by Resource Recovery Systems, claims over 15 years of experience with several small scale plants operating
- details on a typical windrow composting system were provided
- Foster Wheeler is an experienced EFW plant constructor (Occidental Chemical in Niagara Falls, N.Y. and a 1500 TPD facility recently awarded in Montreal)

Initial List of Components

(a) by others

(b)(d) no details

(e) Resource Recovery Systems MRF to recover glass, plastic, metal and paper

- requires that commingled bottles and cans be separated from paper
- yardwaste for composting must be separated and placed in paper bags

(f) mass burn EFW technology proposed

- 3 plants including MRF and composting are proposed to process a total of 2.7 MTPY
- no landfill or plant sites are given

(g)(i) no details

**#31 Reuter of Canada Inc.**

Diversion

- propose to divert 61% of 6000 TPD residential and light commercial waste by 1995

Proven Success

- 400 TPD Eden Prairie, Minnesota plant has been in operation since 1986
- marketing of compost has been a problem
- Buhler-Miag equipment is a well known European MRF manufacturer



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- according to plant representatives, the plant in Eden Prairie achieves
  15 - 20% materials recovery
  20 - 25% compost (presently used as cover in landfill)
  35 - 45% Total Diversion
- an additional 40% is converted to RDF

Initial List of Components

(a) the Rapid Rail automated (1-man) collection system for mixed MSW is proposed
- no source separation enhancements are suggested; in fact system does not require/encourage any

(b)(c) propose to site processing plants at existing landfills and transfer stations in the GTA or on Native North American lands in Sarnia and Kettle Point, Ontario (Chippewas of Sarnia Band Council and Kettle and Stoney Point Council are currently receptive to the concept)

(d) by others

(e) 6 x 1000 TPD MRF and composting facilities to be constructed by 1995 with additional facilities as required thereafter
- European aerobic composting technology also proposed
- located in GTA or Sarnia area

(f) propose to use fine paper recovered by MRF as RDF

(g) no details

(h) to extend the life of existing landfills propose to mine them (no details provided)

(i) claim short lead time requirements for their system

**#42 Browning-Ferris Industries**

Diversion

- a commitment is made towards achieving 50% diversion for the GTA private sector only (commercial/industrial)
- improve reduction by providing waste audits, establish source separation programs and central recycleries, market the final product and establish waste stream-specific disposal facilities



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- provide contract services to support public sector diversion

Proven Success

- developed, operated or have in the approval process, 11 recycleries
- developing recycleries in Windsor and London
- considerable experience in residential and commercial/industrial collection and curbside recycling programs
- own or operate 103 landfills around the world
- also incineration experience

Initial List of Components

(a) enhancement of the commercial/industrial reduction and source separation by consulting, waste audits and providing services for the private sector

(b)(c) not specified

(d) provide source separated collection by truck

(e) establish a series of central processing recycleries, (no details)
composting (no details)

(f) propose waste stream specific disposal sites
offer Ridge landfill, in Harwich/Chatham; propose to expand for GTA waste

(g) will cooperate with R & D programs

(i) many commercial/industrial 3Rs can be implemented in short term

**#72 Markham Disposal**

Diversion

- processing equipment will divert 29% of the waste process, combined with other programs, expect to achieve 50%
- will handle residential waste from York Region and parts of Durham Region only
- will receive and process commercial/industrial waste for York Region, parts of Durham region and Metro
- will receive and process construction and demolition and yard waste from the entire GTA area



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Proven

- experienced in blue box collection programs
- provide OCC recycling for commercial/industrial customers
- operate recycling facilities for York Region
- participating in existing source separation enhancement programs

Initial List of Components

(a) intend to enhance source separation to handle corrugated cardboard and fine paper collection

(b)(c) 2 York Region locations proposed for transfer of processing facilities

(d) by truck

(e) propose to process source separated residential, source separated commercial/ industrial and construction demolition

(f) potential landfill (500 acres) near Uxbridge

(g)(i) not specific



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## 4.4 SCREENING OF PARTIAL SYSTEMS

A summary of the results of the Step S.1 screening is presented in Table 4.3.

**The EOIs which provided insufficient detail for evaluation as a potential system were not considered further. These included EOIs #20 (see-Bah), #35 (Enviromax) and #65(a) (Otto-Canada).**

With respect to the remaining EOIs:

Step S.1-1 Achieve 50% Diversion of Waste

EOIs #7 (Cogenesis), #31 (Reuter), and #72 (Markham Disposal) claim the ability to meet the mandatory diversion criteria for the entire GTA waste stream and EOI #42 (BFI) to meet the criteria for the private sector commercial/industrial waste stream only. All other EOIs indicate that they will not meet this criteria and in most cases propose disposal options such as EFW or Pyrolytic thermal processes to divert waste from landfill.

Step S.1-2 Proven Success of System at Scale Suitable for GTA

EOI #31 (Reuter) demonstrates some level of proven success for the successful diversion of waste based on its 470 TPD facility in Eden Prairie, Minnesota. EOI #42 (BFI) has extensive experience with the Commercial/Industrial sector but does not provide technological details. Other proven components include EFW by #9 (Foster Wheeler) and #35 (Enviromax). EOI #31 also proposes the production of RDF which is a relatively proven component. All other EOI's either provide insufficient information to determine if they are proven or propose technologies such as the Pyrolytic process which are considered unproven.

**Summary of Partial System S.1 Screening**

All EOIs contain components which do not meet both criteria and are therefore assessed as components in Sections 5, 6 and 7.



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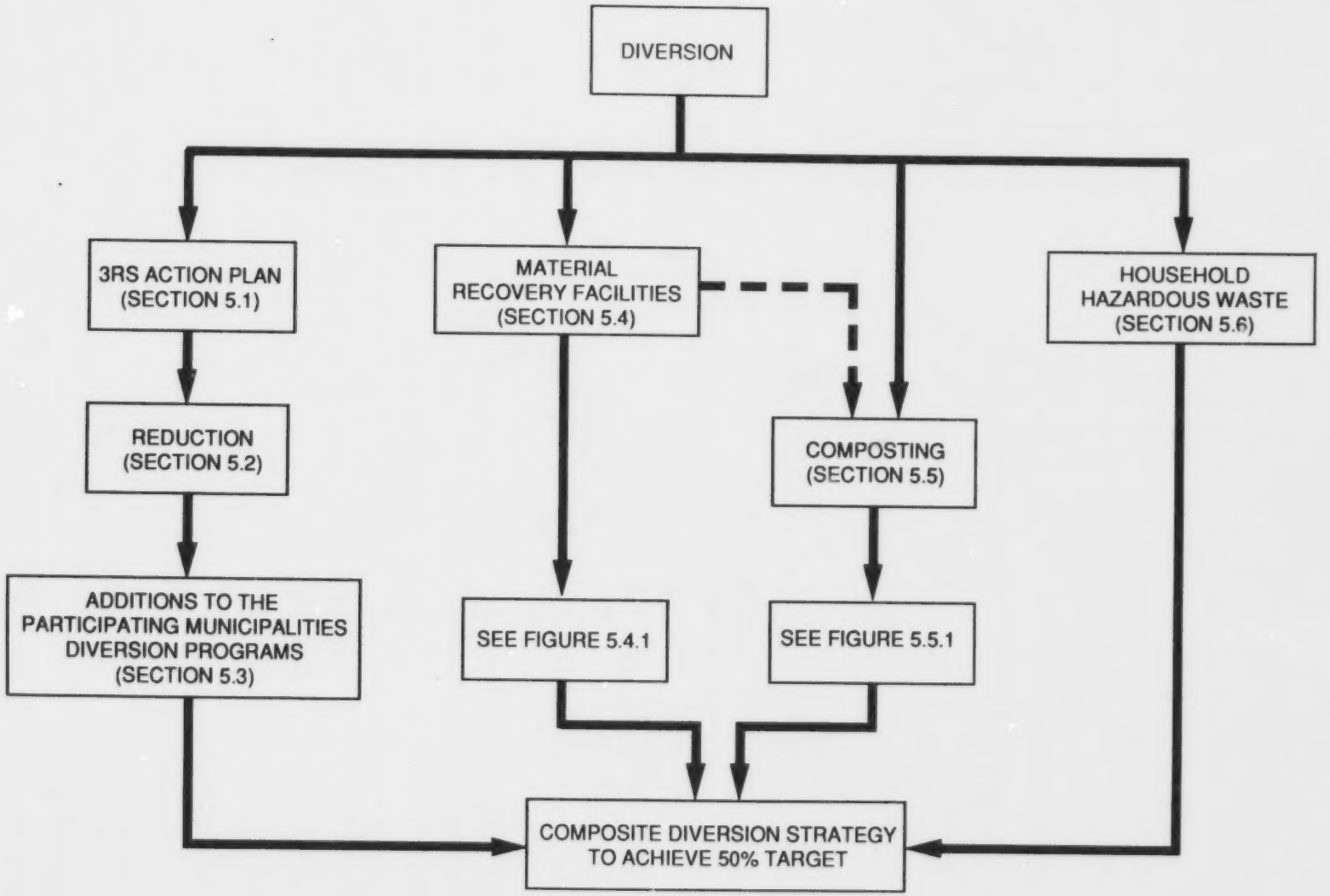
Table 4.3 Summary of Partial Systems Screening, Mandatory Criteria (Step S.1)

| | EOI #4 (Dynavest) (Component Not Proven) | EOI #7 (Cogenisis Corp) (Component Not Proven) | EOI #9 (Foster Wheeler) (Portion of GTA Waste Stream) | EOI #20 (See-Bah) (Insufficient Details) | EOI #31 (Router) (Specific on Components) |
|---|---|---|---|---|---|
| **MANDATORY CRITERIA** | | | | | |
| 1. Achieve 50% Diversion of Waste | . Claim 15 - 20% By others<br>. Residual thermally processed to divert an additional 65-70% from landfill<br>. Char produced | . Claim 53%<br>. Residual thermally processed to divert an additional 20-40% from landfill<br>. Char produced | . Claim 27%<br>Will process up to 2.7 MTPY<br>No Const. and Dem. waste | . No Committment<br>. Thermal process to divert waste from landfill<br>. Aggregate produced | . Claim 61%<br>. RDF proposed to divert additional 25-40% from landfill<br>. 6000 TPD of Residential & Light Commercial Waste |
| 2. Proven Success of System at Scale Suitable for GTA | . No (one 48 TPD pilot facility) | . No (no details) | . Yes for EFW | . No (claimed but not substantiated) | . Confirm Buhler-Miag for MRF technology |
| **INITIAL LIST OF COMPONENTS** | | | | | |
| (a) Addition to Participating Diversion Programs | (a) Not addressed | (a) Not addressed | (a) Expects source separation By others | (a) By others | (a) Source separation not needed Automated Rapid Rail Collection System proposed |
| (b) Receiving Point(s) for Waste from Municipalities | (b) Not addressed | (b) Not addressed | (b) Not addressed | (b) Existing transfer stations (T14 and T15 in REOI) | (b) North York site, Landfills & existing transfer stations |
| (c) Receiving Facilities | (c) At Processing Plant | (c) Not addressed | (c) Not addressed | (c) no details | (c) At (b) or Native North Amer'n land in Sarnia and Kettle Point |
| (d) Transport'n to Processing & Disposal Facility(ies) | (d) Not addressed | (d) Not addressed | (d) Not addressed | (d) By Rail or Water to Sault Ste. Marie | (d) By others |
| (e) Processing Facility(ies) | (e) MRF By others | (e) MRF by SPM Res. Rec. Systems Composting | (e) MRF by Resource Rec. Systems Compost | (e) By others | (e) MRF by Buhler Miag Compost |
| (f) Disposal Facility(ies) | (f) "Pyrolytic" Swept-10 thermal process produces Char product claimed to be marketable | (f) "Pyrolytic" thermal process produces a Char & RDF Gas Char claimed to be marketable | (f) EFW 3 plants | (f) "Pyrolytic" thermal process produces a ceramic aggregate claimed to be marketable as a construction material | (f) RDF for EFW Use existing landfills, life extended by Mining see (h) |
| (g) Research Facility(ies) and Demonstration Projects | (g) Not addressed | (g) Not addressed | (g) Not addressed | (g) Request funding for Pilot Plant | (g) Not addressed |
| (h) Other | (h) Not addressed | (h) Pyrolizer claimed to eliminate need for landfill | (h) Not addressed | (h) Wastewater Sludge Treatment | (h) Mine existing landfills (no details) |
| (i) Short-Term Solutions? | (i) Claim construction schedule of 8 months | (i) Not addressed | (i) Not addressed | (i) Claim pre-1996 start-up is possible | (i) Short-Term facilities |

Table 4.3 Summary of Partial Systems Screening, Mandatory Criteria (Step S.1) cont'd.

| | EOI #35 (Enviromax) (Insufficient Details) | EOI #42 (Browning-Ferris) (Portion of GTA Waste Stream) | EOI #65A (Otto-Canada) (Insufficient Details) | EOI #66 (Pattison) (Component Not Proven) | EOI #72 (Markham Disp/Miller) (Portion of GTA Waste Stream) |
|---|---|---|---|---|---|
| **MANDATORY CRITERIA** | | | | | |
| 1. Achieve 50% Diversion of Waste | . Claim 88 - 90% (excludes EFW no breakdown provided)<br>. will process 1.2 MTPY | . Claim will meet 50% diversion for Privated Sector waste only | . Claim 65% (no details) | . Claim 99% diverted from landfill by thermal process<br>. Aggregate produced | . Claim 60% |
| 2. Proven Success of System at Scale Suitable for GTA | . Claim PROVEN (no details) | - No details but extensive company experience | . One MRF facility in Europe | . No (Pilot Plant in Brisbane, Australia) | . Yes for collection & recycling<br>No MSW MRF experience |
| **INITIAL LIST OF COMPONENTS** | | | | | |
| (a) Addition to Participating Diversion Programs | (a) Not addressed | (a) Enhance Comm/Ind. reduction and source separation, waste audits | (a) Based on Wet/Dry | (a) By others, at source or added to front end of plant | (a) Enhance Blue Box, Corr. & Fine Paper recycling |
| (b) Receiving Point(s) for Waste from Municipalities | (b) Town of Haldimand | (b) In GTA (not specified) | (b) Not addressed | (b) In GTA (not specified) | (b) In GTA<br>(2 existing sites York) |
| (c) Receiving Facilities | (c) Processing Facilities | (c) At Processing Facilities | (c) Not addressed | (c) At Processing Facilities | (c) At Processing Facilities |
| (d) Transport'n to Processing & Disposal Facility(ies) | (d) By Truck or Rail | (d) By Truck or Rail | (d) Not addressed | (d) Not addressed | (d) By Truck |
| (e) Processing Facility(ies) | (e) MRF<br>Wood Waste recovery<br>Tire processing<br>Oil Recovery | (3) Recyleries (BFT TM)<br>Composting | (e) MRF<br>Composting<br>Const. & Dem. Processing<br>(no details) | (e) MRF can be incorporated by others<br>Metals recovery only | (e) MRF Mixed MSW and Comm/Ind. Const. & Demolition waste |
| (f) Disposal Facility(ies) | (f) EFW (4,000 TPD)<br>Landfill (125-165 acres on 407 acre site) | (f) Waste stream specific disposal facilities | (f) Incineration<br>Landfill<br>(no details) | (f) Neutralysis - mix clay with resid'l MSW and liquid waste creates aggregate & combustible gas; claims no landfill required | (f) Landfill - 500 acres |
| (g) Research Facility(ies) and Demonstration Projects | (g) Not addressed | (g) Will participate in R & D | (g) Co-operate with schools etc. | (g) Not addressed | (g) Conceptual |
| (h) Other | (h) Not addressed | (h) Manage entire Comm/Ind (co-op with Competitors) | (h) Wastewater Sludge Treatment | (h) Not addressed | (h) Not addressed |
| (i) Short-Term Solutions? | (i) Not addressed | (i) Early implementation of 3R's for Comm/Ind. sector | (i) NO | (i) Not addressed | (i) Not addressed |

**FIGURE 5.1: DIVERSION**


DIVERSION
3RS ACTION PLAN (SECTION 5.1)
MATERIAL RECOVERY FACILITIES (SECTION 5.4)
HOUSEHOLD HAZARDOUS WASTE (SECTION 5.6)
REDUCTION (SECTION 5.2)
COMPOSTING (SECTION 5.5)
ADDITIONS TO THE PARTICIPATING MUNICIPALITIES DIVERSION PROGRAMS (SECTION 5.3)
SEE FIGURE 5.4.1
SEE FIGURE 5.5.1
COMPOSITE DIVERSION STRATEGY TO ACHIEVE 50% TARGET

## 5.0 DIVERSION

This section of the report describes the various diversion components received in the EOIs.

As defined in the REOI, diversion includes the Reduction, Re-Use and Recycling of wastes prior to Disposal by incineration and/or landfilling. For the purpose of the analysis of information, and subsequent evaluation, thermal processes such as pyrolysis are also considered to be Disposal.

### 5.1 3Rs ACTION PLAN

SWISC is developing an Action Plan for waste Reduction, Re-use and Recycling within the GTA. A series of workshops were held with representatives from each Region; a number of municipalities; the MOE; purchasing agents; the Recycling Advisory Committee; and the Recycling Council of Ontario. The overall objectives for these workshops and the plan are to:

- Inventory current 3Rs initiatives
- Identify opportunities for collaboration within the GTA; and
- Develop an Action Plan for improving the effectiveness of 3Rs efforts within the GTA starting as soon as possible and continuing through the implementation of the long-term waste management system.

All ideas with respect to the 3Rs presented in the EOIs, as well as those EOIs which propose specific actions which could assist the 3Rs in the short term, have been extracted. Both groups were submitted to the 3Rs sub-committee.

A separate report has been prepared on the Action Plan. The Recommendations from that report will be co-ordinated with the recommendations contained in this EOI technical review.

### 5.2 REDUCTION

In the context of this report, waste reduction is used to mean the elimination, prevention or restriction of waste generation at its source. It has been identified in many studies of the 3Rs as



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the obvious first priority in addressing the problem of waste management and was endorsed by SWISC as such.

Metro's SWEAP Discussion Paper 1.3, "A Regulatory Agenda for Solid Waste Reduction", June 1989 and SWISC's 3Rs Action Plan address implementation of reduction in detail.

A Task Force set up by CCME (Canadian Council of Ministers of the Environment) is developing Packaging Policies for Canada. The objective is to reduce packaging waste in the waste stream by 50% by 2000 from 1988 levels. Both post-consumer and industrial packaging wastes are targeted. At this stage, the protocol is very general due to the fact that industry does not want to be regulated and, more importantly, there is no single best solution, e.g. what works for cans in Ontario, doesn't in other provinces.

The protocol work is aimed at producing some guidelines and directions by 15 April, 1990. There is an extensive action plan following this work in order to identify best solutions, fit the protocol with individual provincial waste management strategies, gauge industry capability, ensure that the rules apply to both imports and domestically produced packaging and determine how the plan is to be monitored (and funded) including penalties and incentives.

All ideas with respect to reduction in the EOIs were extracted and forwarded to the 3Rs Action Plan group to ensure that they were fully considered. These may be summarized as follows:

**Reduction**

| | | |
|---|---|---|
| EOI #11 | (p 3) | reduction of diaper size and packaging |
| EOI #14 | (p 2.8) | National Packaging Protocol - Canada wide policies |
| EOI #21 | (p 29, 31) | oppose shopping bags and other forms of excess packaging |
| EOI #48 | (p 5, 2.3, 1-3) | revised packaging and returnable requirements |
| EOI #60 | (p 4, LURA)[1] | System 4; emphasis on repairing incoming materials |
| | (p 19, LURA) | much more effort is needed in the area of reduction |
| EOI #83 | (p 3) | voluntary and legislative actions and incentives for the reduction of packaging. Refillable containers, specifications towards min. |

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1. EOI #60 was summarized by LURA Group: reference is to the summary.



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packaging requirements on municipal tender documents. Reduction of throw-aways and manufacturers be encouraged to make modifications.

**Education**

| | | |
|---|---|---|
| EOI #2 | (p 2.41) | general public education |
| EOI #12 | (p 6, 17) | generators must be taught to source separate |
| EOI #14 | (p 2.11) | teach backyard composting |
| EOI #21 | (p 20, 28, 30) | public participation, determine social costs of wastes |
| EOI #48 | (p 2.1-9, 2.2.9-1) | public education, the establishment of a co-ordinating committee with specific mandates |
| EOI #60 | (p 19, LURA) | alternatives to polystyrene and toxic household cleaners |
| EOI #50 | (p 73) | public education through visitations |
| EOI #73 | (p 21) | prepared to offer funding for educational programs |

**Home Backyard Composting**

| | | |
|---|---|---|
| EOI #14 | (p 2.3, 2.11) | a part of municipal and private recovery |
| EOI #21 | (p 31) | suggest expansions in this area |
| EOI #27 | (p 3) | complements their program |
| EOI #30 | (p 5) | highly recommend |
| EOI #67 | (p 6) | suggest home composting |
| EOI #83 | (p 4) | promote |

**Other efforts to note are:**

The recent creation of OMMRI-2 where packaging manufacturers and others have become involved in the Reduction/Re-use/Recycling.

The Ministry of the Environment has committed that Reduction is key before Re-use and Recycling.

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**Summary**

At this time, there is no specific target for percent diversion of the total waste stream which may be achieved by reduction. However it is confirmed as first priority in the 3Rs hierarchy.

## 5.3 ADDITIONS TO THE PARTICIPATING MUNICIPALITIES' DIVERSION PROGRAMS

Many of the EOIs contributed ideas or wished to reinforce those ideas that have been identified in other reports. The EOIs, in most cases, have not offered systems or specific components for these programs, but have suggested that they be a part of the Long-term Waste Management System for the GTA. To acknowledge those EOIs that have directly addressed these ideas we have stated the idea, given their EOI number, listed a page reference and have included a brief interpretation of the respondents' ideas.

### 5.3.1 Summary of Ideas from the EOIs with Respect to the 3Rs

**Reduction at Source** (see Section 5.2)

**Education** (see Section 5.2)

**Home Backyard Composting** (see Section 5.2)

**Mandatory Recycling**

| | | |
|---|---|---|
| EOI #14 | (p 2.30) | base level of service mandatory within each municipality |
| EOI #31 | (p 2) | totally unnecessary with their system |
| EOI #50 | (p 74) | a must, especially for certain materials; i.e. batteries, tires and household hazardous wastes |
| EOI #69 | (p 4) | mandatory plus 5 containers can achieve 100% participation |

As of 1 January 1990, Halton Region has stated that all residents that receive garbage collection service must use their Blue Box.



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**Bans from Landfill**

| | |
|---|---|
| EOI #12 (p 15) | encourage bans on drywall |
| EOI #14 (p B.2, B.14) | recycling efforts are greatly assisted |
| EOI #56 (p 4) | 100% recovery of wood from commercial/industrial could be achieved |
| EOI #83 (p 5) | extend to include glass, metals and plastics |

All regions within the GTA have banned old corrugated from landfill and transfer sites. Further bans are pending on drywall and wood pallets.

**Research Programs**

| | |
|---|---|
| EOI #3 (p 5, 27) | market research |
| EOI #8 (p 2.14) | systems research |
| EOI #13 (p 17) | further applications to their process |
| EOI #14 (p 2.10, 2.21) | needs and opportunities, market and market development |
| EOI #16 (p 10) | suggest a research facility at their landfill operations |
| EOI #17 (p 40) | project technology, facility at Seneca College |
| EOI #21 (p 31) | waste comparisons with other countries |
| EOI #22 (p 8, 23) | labs in Canada and Italy |
| EOI #23 (letter) | access to background Information and technologies |
| EOI #24 (p 6) | equipment modifications |
| EOI #35 (p 10) | new exhaust systems for vehicles |
| EOI #38 (p 13) | examine chemical compositions of packaging |
| EOI #42 (p 15) | waste specific disposals |
| EOI #48 (p 5, 6, 2.2.8-1) | a facility, establish secondary disposal sites for non-putrescible wastes |
| EOI #50 (p 73) | continued search for established uses of diverted product |
| EOI #51 (p 82) | funding programs, improve MRF components, new end uses or markets for materials |
| EOI #52 (p 4) | transportation, processing, marketing, environmental protection |
| EOI #67 (p 29) | formation of a research division |
| EOI #69 (p 20) | currently completing a feasibility study for composting |
| EOI #74 (p 1) | compost facility |

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| | | |
|---|---|---|
| EOI #78 | (p 11-1) | maximize local content |
| EOI #79 | (p 9) | a GTA center for waste reduction |
| EOI #83 | (p 5) | improved methods of composting and more efficient transportation |

**Demonstration Projects**

| | | |
|---|---|---|
| EOI #11 | (p 4, 6) | composting and recycling of disposable diapers |
| EOI #21 | (p 19) | compost project in Edmonton, Alberta |
| EOI #74 | (p 1) | compost facility |

**Management Services**

| | | |
|---|---|---|
| EOI #2 | (p 2.41) | recycling and marketing programs |
| EOI #8 & #14 | (p 1.1) | development, operations, joint ventures |
| EOI #33 | (letter) | development of power generation facilities |
| EOI #39 | (p 2.1) | project management and design |
| EOI #42 | (p 15) | product marketing, contract services for household waste management |
| EOI #48 | (p 3-5, 2.2.7-5) | government participation along with the establishment of a central marketing board |
| EOI #85 | (p 1) | management and information services |

**Continue Class 1 Blue Box Programs**

| | | |
|---|---|---|
| EOI #3 | (p i) | very compatible with curbside |
| EOI #5 | (p 13) | residential waste will only be used after curbside |
| EOI #6 | (letter) | to be done by municipalities and regions |
| EOI #9 | (p 1) | can take source separated & commingled materials |
| EOI #13 | (p 9) | with curbside a purer form of garbage can be processed |
| EOI #14 | (p 2.4) | classify under a heading of Municipal/Private Reduction and Recovery |
| EOI #22 | (p 3) | in conjunction with or independent of |
| EOI #27 | (p 3) | system complements Blue Box |
| EOI #31 | (p 2) | could continue, but would prefer elimination |
| EOI #32 | (p 4) | system can strengthen current programs |
| EOI #34 | | can enhance existing programs (recycling section) |
| EOI #38 | (p 12) | enhanced by increasing number of materials |



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| | | |
|---|---|---|
| EOI #40 | (p 6) | add-on to existing programs |
| EOI #42 | (p 9) | more involvement by the public sector |
| EOI #43 | (p 13) | continue programs to enhance their EFW |
| EOI #44 | (p 9) | compliments any curbside program |
| EOI #48 | (p 3, 2.2.5-7, 2.3.1-9) | want to accommodate in its proposed system |
| EOI #59 | (p 1, 4) | fully complements curbside recycling |
| EOI #60 | (p 2, LURA) | System 1; suggest 2 additional bins, one for additional recyclables, the other for food wastes |
| EOI #61 | (p 4) | continue, and want to handle material generated |
| EOI #63 | (p 19) | want all MSW with the exception of curbside |
| EOI #65 | (p 11) | their system is a natural evolution from Blue Box |
| EOI #70 | (p 5) | after Blue Box collection |
| EOI #73 | (p 3) | process materials that have been thoroughly recycled |
| EOI #78 | (p 4-2) | facility provides the missing link beyond Blue Box |
| EOI #83 | (p 5) | successful, must expand |

**Expand the Number of Materials in the Blue Box**

| | | |
|---|---|---|
| EOI #9 | (p 20) | include mixed papers and OCC |
| EOI #14 | (p B.27, 29) | expand residential plastic and paper collection |
| EOI #42 | (p 9) | more involvement by the public sector |
| EOI #67 | (p 6) | add mixed plastics, packaging, OCC, boxboard, mixed paper |
| EOI #69 | (p 1) | change the system to coloured bags and add plastics, paper and food |
| EOI #76 | (p 1) | change the materials to paper, glass and heavy plastics |
| EOI #83 | (p 5) | extend to include plastic items |

**Expand Blue Box Collection**

| | | |
|---|---|---|
| EOI #14 | (p B.8) | to include apartments and commercial operations |
| EOI #34 | | expand to apartments and condominiums (recycling section) |
| EOI #42 | (p 9) | to include apartments and rural to be handled by the public sector |
| EOI #67 | (p 6) | to include apartments and rural collections |
| EOI #69 | (p 7) | change the system to coloured bags, green for metals, glass and plastic; black for newspaper |
| EOI #77 | (p 2-4) | change system to 3 boxes, wet wastes, paper and regular Blue Box |



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| | | |
|---|---|---|
| | | materials |
| **Blue Box Program Unnecessary** | | |
| EOI #13 | (p 2) | can take sorted or unsorted curbside garbage |
| EOI #21 | (p 18, 28) | wet/dry system |
| EOI #22 | (p 3) | in conjunction with or independent of |
| EOI #24 | (p 4) | accomplishes recycling without Blue Box collection |
| EOI #25 | (p 6.2, 6.4) | waste does not require pre-treatment, benefits of not having a Blue Box system are stated |
| EOI #31 | (p 12) | suggest elimination so that their system can benefit from the recovery of recyclables |
| EOI #46 | (p 1-3, 2-1) | need processable wastes to make their ORFA product |
| EOI #51 | (p 3) | eliminate Blue Box for a wet/dry system |
| EOI #60 | (p 9, LURA) | use a drop-off system instead of curbside |
| EOI #71 | (p 1) | assumes the elimination of Blue Boxes for wet/dry |
| **Office Paper Recovery Programs** | | |
| EOI #14 | (p 2.5) | delivered to a dedicated processing center |
| EOI #48 | (p 2.2.1-3) | suggest Grey Box system for offices |
| EOI #72 | (p 1) | cube vans for the collection of 90 pound containers |
| **Commercial/Industrial Programs** | | |
| EOI #5 | (p 13) | could be included in program as necessary |
| EOI #37 | (p 8) | recovery and recycling of wood wastes |
| EOI #38 | (p 12) | can take packaging and food wastes |
| EOI #42 | (p 14) | do waste audits and set up source separation |
| EOI #48 | (p 5) | extend existing programs to include commercial/industrial |
| EOI #51 | (p 4) | a commercial/industrial wet/dry program |
| EOI #55 | (p 2) | enhance visions of source separation |
| EOI #56 | (p 3) | recovery and recycling of wood wastes |
| EOI #65 | (p 8) | using technological advances |
| EOI #72 | (p 3) | provide limited receiving and processing facilities |
| **Construction/Demolition Programs** | | |
| EOI #12 | (p 1) | drywall collection at construction sites |



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| | |
|---|---|
| EOI #14 (p 2.5, 2.19) | delivered to a dedicated processing center |
| EOI #15 (p 1) | use of quarry and aggregate equipment |
| EOI #22 (p 9) | access to German technology |
| EOI #45 (p 1, 34) | wood, drywall recovery at transfer sites also systems for soil cementing |
| EOI #48 (p 5) | regulations for source segregation |
| EOI #51 (p 5) | separate collection system |
| EOI #55 (p 2) | enhance visions of source separation |
| EOI #57 (p 2) | the reuse of construction/demolition as well as soil and fill |
| EOI #72 (p 3) | provide limited receiving and processing facilities |

**Full Wet/Dry Collection for Composting**

| | |
|---|---|
| EOI #21 (p 18, 28) | preferable system, separate waste collection |
| EOI #51 (p 3) | wet/dry collection to include households and apartments |
| EOI #65A(letter) | dry recyclables, wet kitchen and yard wastes |
| EOI #71 (p 1) | assumes a wet/dry system will occur |

**Garden and Leaf Collection for Composting**

| | |
|---|---|
| EOI #9 (p 1) | suggest composting of yard wastes only |
| EOI #30 (p 2) | composting of yard wastes only |
| EOI #51 (p 5) | separate yard waste collection |
| EOI #65A(letter) | wet includes kitchen and yard wastes |
| EOI #69 (p 7) | orange bag for the collection of yard wastes |
| EOI #72 (p 3) | provide limited receiving and processing facilities |
| EOI #77 (p 3-2) | special waste collection |
| EOI #83 (p 5) | Municipal collection |

**Household Organics Collection for Composting**

| | |
|---|---|
| EOI #14 (p 2.2, 2.4) | can get a purestream of organics |
| EOI #21 (p 18, 28) | suggest a full wet/dry system |
| EOI #27 (p 17) | separate collection system |
| EOI #41 (p 2) | organics into the sewage system via garbage grinders |
| EOI #51 (p 3) | wet/dry system includes households and apartments |
| EOI #65A(letter) | dry recyclables and wet kitchen and yard wastes |



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| | | |
|---|---|---|
| EOI #67 | (p 6) | separate collection of home organics |
| EOI #69 | (p 7) | a clear bag for the collection of organics and paper |
| EOI #77 | (p 2-4) | 3 box system one for wet wastes, one for paper, one for regular Blue Box material |

**Commercial Organics Collection for Composting**

| | | |
|---|---|---|
| EOI #14 | (p 2.4, 2.12) | can get a purestream of organics |
| EOI #27 | (p 18) | separate collection |
| EOI #77 | (p 2-4) | 3 box system, one for wet wastes, one for paper one for the normal Blue Box waste |
| EOI #38 | (p 12) | can take packaging and food wastes |

**Transportation and Collection Enhancements**

| | | |
|---|---|---|
| EOI #8 | (p 2.3) | material collected and transferred through handling centres |
| EOI #9 | (p 20) | separate collection days and/or vehicles for different materials |
| EOI #21 | (p 18) | two compartment trucks for wet/dry materials |
| EOI #26 | (p 7) | special vehicles to pick-up igloos |
| EOI #27 | (p 17) | separate pick-up of organics |
| EOI #31 | (p 12) | rapid rail automated pick-up system |
| EOI #52 | (p 6) | rail transportation plan |
| EOI #60 | (p 2, LURA) | System 1; modified garbage trucks for compostables and recyclables |
| EOI #61 | (p 4, 50) | intermodal transportation facilities |
| EOI #62 | (p 4) | intermodal freight systems |
| EOI #73 | (p 4) | delivery of material to EFW plant in Newfoundland |

**Depots and Drop-Off Centres**

| | | |
|---|---|---|
| EOI #14 | (p 2.9, B.9) | suggest universal drop-off centers |
| EOI #26 | (p 7) | igloos for litter control, high traffic areas |
| EOI #43 | (p 13) | suggest igloo program to enhance their EFW plant |
| EOI #48 | (p 2.2.2-3) | facilities at receiving stations |
| EOI #60 | (p 3, LURA) | System 3; drop-off containers at recycling facility |
| | (p 9, LURA) | System 11; use of 4 bin system and drop-off centres |
| | (p 13, LURA) | System 18; drop-off centres at waste storage facilities |



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**Hazardous Wastes**

| | | |
|---|---|---|
| EOI #17 | (p 12) | can accept most hazardous wastes |
| EOI #22 | (p 9) | can deal with a Vortex burner |
| EOI #32 | (p 3) | can be set up as HHW collection stations |
| EOI #60 | (p 2, LURA) | System 1; set up separate collection |
| | (p 9, LURA) | System 12; recovery of toxic metals from batteries |
| | (p 13, LURA) | System 17; national battery collection program |
| EOI #66 | (p 9) | encourage source separation |
| EOI #67 | (p 6) | special collection, storage and safe disposal |
| EOI #69 | (p 7) | the use of Blue Boxes for the collection of H.W. |
| EOI #73 | (p 13) | able to dispose of HHW |

**Other Materials**

| | | |
|---|---|---|
| EOI #12 | (p 1) | drywall collection |
| EOI #22 | (p 10) | tire freezing with liquid nitrogen |
| EOI #35 | (p 8, 9) | crumbing of tires, metered injection system for used oil and a new fibre board plant for wood |
| EOI #37 | (p 8) | recovery and recycling of wood wastes, delivered |
| EOI #38 | (p 4) | recovery and composting of food and health care wastes |
| EOI #51 | (p 3) | systems for tire shredding, appliance reclamation and waste oil recovery |
| EOI #60 | (p 3, LURA) | System 2; conversion of mixed plastics into useable products |
| | (p 10, LURA) | System 13; incineration of tires for fuel |
| | (p 11, LURA) | Systems 14 & 15; processing of tires |
| | (p 14, LURA) | System 19; extract oil from tires |
| | (p 15, LURA) | System 20, 21 & 22; polystyrene recycling |
| EOI #66 | (p 9) | encourage source separation of batteries |
| EOI #77 | (p 3-2) | special collection of wood |
| EOI #78 | (p 9-1) | scrap tire disposal |
| EOI #83 | (p 2) | stockpile for future use |

**Waste Exchanges**

| | | |
|---|---|---|
| EOI #83 | (p 4) | post consumer materials exchange; donations of clothing building material outlets; individual and group incentives, i.e. garage sales; manufacturers should be encouraged to become involved. |



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**Summary**

These ideas have been considered in the 3Rs Action Plan and in the overall evaluation of the EOIs and the recommendations with respect to further development of the long-term waste management system.

### 5.3.2 Collection Systems - Description and Screening

In order to achieve SWISC's diversion targets it is necessary to consider the two basic collection systems proposed in the EOIs, namely:

- enhancement of the present Blue Box system; and
- switch to a Wet/Dry system.

These are generally applied to the recovery of materials from households and commercial/light industrial waste generators. In the context of the following review they do not include separate waste streams from the private sector such as construction and demolition materials; office waste programs; selected materials such as wood, tires, drywall, etc.

The two basic systems are described, common features identified and the Advantages and Disadvantages compared.

**European Wet/Dry**

A wet/dry collection/processing system usually entails a two-bin collection system, one for wet food wastes and the second for clean, dry material. A three-bin system would use the third bin or bag for contaminated wet and dry materials. Present Blue Box curbside collection programs are eliminated.

In the two-bin system all household and commercial wet materials are collected in one bin, all dry materials are collected in a second.

Five EOIs have suggested a wet/dry collection process as a part of their system.



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One EOI, #77 (Montenay Inc.), is not considered simply wet/dry as they have suggested a three-bin system; wet wastes in one, dry wastes in a second and the third for regular Blue Box materials. We have included it in as a wet/dry system, but have also referenced it as an enhanced Blue Box system.

For this comparison EOI #51 (WMI) has been used as a base reference.

Wet/Dry Residential and Commercial Collection

Containers

- two container system that would replace existing Blue Boxes
- residents place out two containers, one with all their wet waste, the second with all their dry
- apartments and commercial locations would be collected in the same way, but would have a different container design

Vehicles

- much the same as vehicles presently in use, front-end, rear and side loading types
- one vehicle for wet material, one vehicle for dry
- a preferable vehicle would be one that could accommodate both materials separately (alternative vehicles are being developed and tested at this time - EOI #51)

Wet/Dry Residential and Commercial Processing

Dry

- mixed material loaded into ballistic separators divides the mix into light and heavy fractions
- the light fraction is manually sorted to recover recyclable materials
- the heavy fraction is separated with a combination of mechanical and manual processes

Wet

- composted: various processes available (for details on different methods see Section 5.5)



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Observations - Metro Works Tour

The observations of the "Inspection Tour Group Report on European Wet/Dry Processing Plants" by the Commissioner of Works, Metropolitan Toronto, 12 September 1989, have been condensed as follows:

- development of dry processing equipment is still immature
- equipment built only 4 years ago is now considered obsolete
- latest design is still imperfect and relies mainly on hand-sorting
- one manual sorter can only process about 12 tonnes per hour
- recovery rates from dry collection are not substantially higher than from the Metro Blue Box program currently recovering about 12 per cent of residential waste. Tonnages released by the staff at Neunkirchen indicate only 14 per cent residential waste was actually recovered.
- Canadian markets for recycled paper are not nearly as strong as those in Europe
- wet dry separation of material is relatively simple and easy for the householder, but perhaps too easy as it fails to provide for the effective removal by the generator of hazardous contaminated and other waste which requires disposal
- does not build on the blue box program; but is distinctly different, as it relies mainly on the municipalities, rather than the generator, to separate recyclable material from waste
- high productivity and efficiency of European collection service; such opportunities for mechanization should be examined
- recommend that we proceed with a 3 stream approach of blue box with increased materials, wet and other waste collection.

**Enhanced Blue Box System**

A curbside Blue Box program for collection and processing usually entails a two bin collection system, one for source separated recyclable materials (Blue Box), the second bin or bag is for mixed wastes. An enhanced collection system includes the collection of household organics in bags or a third container. Householders prepare, i.e. rinse, their recyclables and place them into their Blue Box. All their wet wastes are saved and placed in a second container for collection. The remaining wastes are contained or bagged.



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Five EOIs, other than those proposing wet/dry collection systems, suggested a separate collection of household organics. One of the five suggested garbage grinders as an alternative for organics. This has been considered in the past in the GTA but not pursued because of cost and the concept that it transfers the problem to the sewage treatment plants.

EOI #69 suggests that paper can also be included in the organics collected. Other EOIs have suggested materials that should be added to Blue Box collection as noted in Section 5.3.1.

For this comparison, EOI #67 (Laidlaw) has been used as a base reference.

Enhanced Blue Box Collection

Containers

- continued use of the existing Blue Box, plus a second box or bag for the recovery of household organics
- some material will still need to be collected through regular garbage collection

Vehicles

- Blue Box collection would continue with existing methods of either compartmentalized trucks for source separation or the collection of newspaper and commingled recyclables
- separate collection of household organics could be achieved with existing packer (garbage) trucks
- other garbage would be picked up separately

Enhanced Blue Box Processing

Recyclables

- using existing Material Recovery Facilities, materials would be handled with existing methods of combined manual and mechanical recovery for both source-separated and commingled materials



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- mixed wastes would be delivered to Processing Centres where they would be directed through breaking machines and trommels that would segregate it into three distinct grades, undersized, medium-sized and oversized
- these grades would be separated by mechanical processes

Organics

- composted: various processes are available (for details on different methods see Section 5.5)

Additional processing facilities would be required to increase diversion to the 50% target.

Features Common to Both Blue Box and Wet/Dry Systems

- require increased education for residents
  - small amount for Blue Box add-on program
  - larger amount for Wet/Dry system
- require separate vehicle collections
  - Blue Box - recyclables (existing), organics; mixed wastes (existing)
  - Wet/Dry - wet wastes; dry wastes
- benefit from specially designed vehicles
  - Blue Box - most operations have already been established
  - Wet/Dry - vehicles are being developed
- use a combination of mechanical and manual processes
  - Blue Box - minimal amount of manual processing as material is source separated by collection crews, also, containers have been rinsed by householders. Commingled material uses more mechanical separation
  - Wet/Dry - more processing at recovery centre as material is collected and received mixed and must be manually, as well as mechanically sorted
- require special bins and collection methods for apartments and other multi-tenant units; recent studies on implementation are encouraging; building regulations may have to be adapted to facilitate



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## Advantages & Disadvantages - Blue Box vs. Wet/Dry

| System | Advantages | Disadvantages |
|---|---|---|
| Wet/Dry | | |
| | - opportunity to collect a large amount of potentially recyclable products not dependent on source separation<br>- simple collection | - materially potentially high in contamination/more difficult to market<br>- require new facilities i.e. EOI #51-10 processing/ composting plants<br>- less effort and involvement by the public, lessens awareness to the problem |
| | - simple for householder | - abandons efforts and investments (vehicles, boxes etc.) in the Blue Box. May set back public confidence in reduction and recycling.<br>- technological methods still immature; for maximum recycling a high amount of manual labour is needed<br>- highly questionable as to workers health and safety* |

* from Metro Report; dated 12 September 1989



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Enhanced Blue Box

- easier removal and control of contaminants on separately collected materials/more easily marketed
- collection systems in place for recyclables
- keeps the public involved and aware
- designed to collect and process only selected number of materials
- require some additional facilities i.e. EOI #67
- (5 processing 2 composting)
- problems could arise in collection when adding more items to Blue Box
- additional processing required for materials not separated at source

**Summary of Blue Box vs. Wet/Dry**

The concept of a wet/dry collection processing system, to maximize diversion of materials, requires further evaluation and should be considered as a potential alternate method as required by the EAA. Of major concern though is the elimination of the present Blue Box recycling programs. The time and effort contributed by both municipalities and residents as well as the major investments made in vehicles and equipment at the recovery centres has to be considered.



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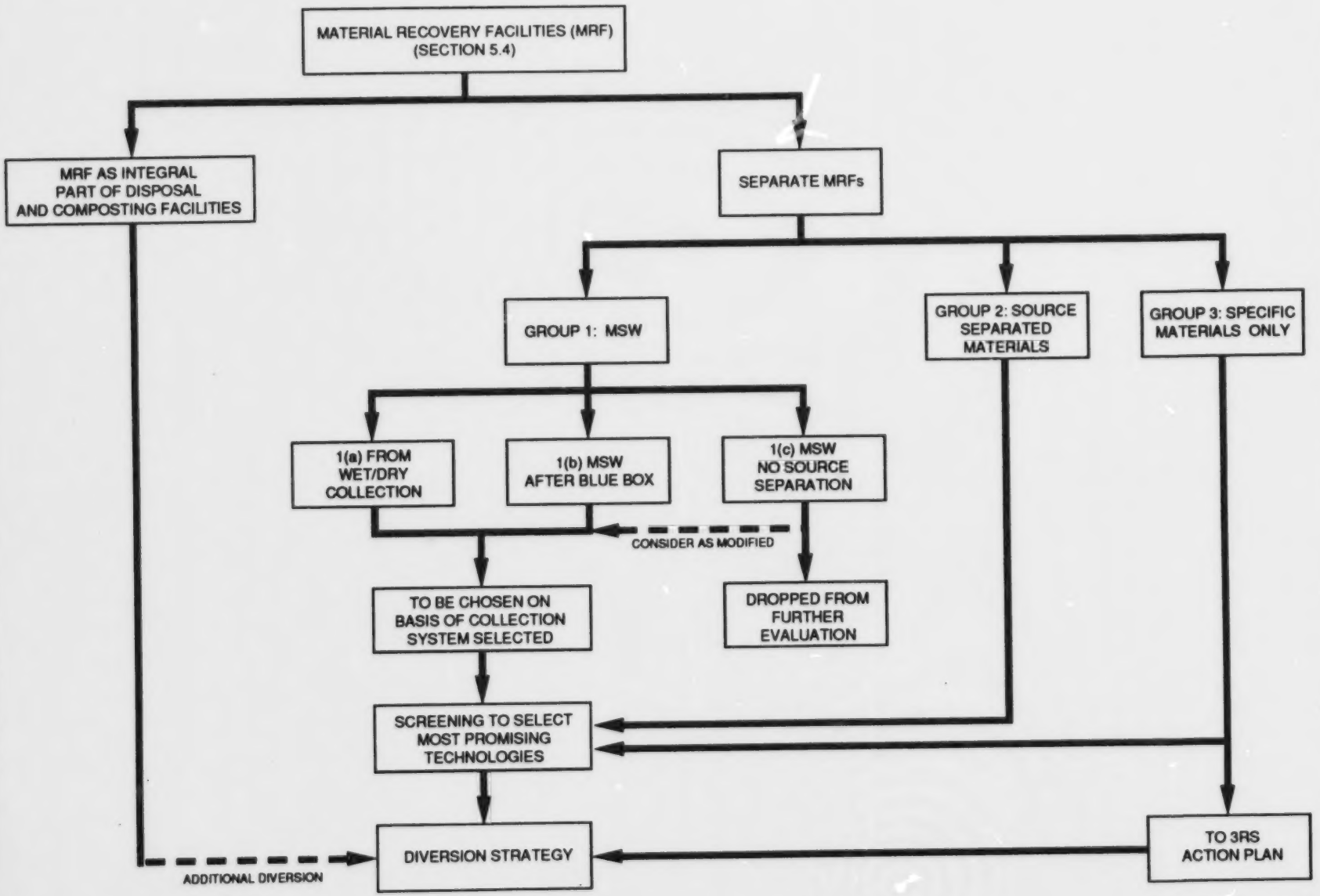
## FIGURE 5.4.1: MRFs


MATERIAL RECOVERY FACILITIES (MRF) (SECTION 5.4)
MRF AS INTEGRAL PART OF DISPOSAL AND COMPOSTING FACILITIES
SEPARATE MRFs
GROUP 1: MSW
GROUP 2: SOURCE SEPARATED MATERIALS
GROUP 3: SPECIFIC MATERIALS ONLY
1(a) FROM WET/DRY COLLECTION
1(b) MSW AFTER BLUE BOX
1(c) MSW NO SOURCE SEPARATION
CONSIDER AS MODIFIED
TO BE CHOSEN ON BASIS OF COLLECTION SYSTEM SELECTED
DROPPED FROM FURTHER EVALUATION
SCREENING TO SELECT MOST PROMISING TECHNOLOGIES
DIVERSION STRATEGY
TO 3RS ACTION PLAN
ADDITIONAL DIVERSION

## 5.4 MATERIAL RECOVERY FACILITIES (MRF)

The use of MRFs in North America to increase the quantities of materials diverted from disposal has been increasing rapidly in recent years. The 1990-91 edition of the Materials Recovery and Recycling Yearbook published by Governmental Advisory Associates Inc., N.Y. examines 104 facilities in various stages of planning or operation in the United States. Of these, almost one-half (51%) are in early or advanced stages of planning, 11% are under construction and about one-third (34%) are operational. Another four facilities are temporarily shut-down or undergoing significant retrofitting. Although this is a significant base reference, it lists only facilities which process source separated or commingled source separated wastes and does not include all MRF operations. Several additional facilities have been referenced in the EOIs and elsewhere.

Material recovery facilities generally involve a combination of manual and mechanized sorting and processing. They potentially offer a significant means of meeting the diversion targets. Numerous technologies have been proposed in the 51 EOIs submitted to recover materials and/or process the wastes to produce a material which would be suitable for other uses such as compost and RDF. As RDF is not considered in the diversion targets it was necessary to identify separately the percentage of wastes to RDF from the MRFs.

MRFs are designed to accept and process different waste streams and therefore have been grouped in this analysis by the incoming waste stream. Within each group, the pertinent technologies have been analyzed. Existing plants referenced by the respondents have been verified for performance and operating details where possible. Assistance was obtained for this verification from the consulting firm of Gershman, Brickner and Bratton Inc., Falls Church, Virginia, who are familiar with many of the installations which were referenced in the U.S.A.

The analysis was designed to determine compliance with the mandatory proven criterion, including the diversion to be obtained and the types of materials expected to be recovered or produced. To provide a common base reference for determination of the scale of the proposed or existing facilities, the anticipated wastes generated from the GTA (20,276 TPD in the year 2000) was used. All comparisons are on a TPD basis. When existing plant capacities were given in TPH, an operating day of 10 hrs was assumed. When capacities were given in TPY, a 260 day operating year was assumed.



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### 5.4.1 Group 1 - MRFs Which Process Mixed Wastes

This group of MRFs represents those which accept mixed solid wastes and is divided into the following subgroups:

(1a) MRFs which process mixed wastes from the Wet/Dry collection system.
(1b) MRFs which process mixed wastes (excluding Blue Box materials).
(1c) MRFs which process mixed wastes (no source separation).

Twenty-two EOIs are found in Group 1. The key features of Groups 1(a), 1(b) and 1(c) are summarized on Tables 5.4.1, 5.4.2 and 5.4.3, respectively found at the end of this section.

**Group 1(a) MRFs Which Process Mixed Wastes from Wet/Dry Collection**

Table 5.4.1 shows three EOIs, #51 (WMI), #65(a) (Otto-Can) and #71 (Env. Air) which specifically indicated that waste should be separated into wet and dry fractions during collection and before delivery to the MRF.

EOI #51 (WMI) proposes to employ MRF technology by Brini. At least nine Brini plants exist, largely in Scandinavia, with one plant referenced in Japan. Plant sizes vary from 100 to 300 TPD and are based on up to 3 separate modules, the use of which depends on the desired diversion and final product. Most existing plants produce an RDF product. EOI #3 (Advanced Ecology) also proposes Brini technology but does not specifically refer to wet/dry collection and is discussed in Group 1(b). Information on the performance or diversion levels achieved by the existing Brini plants was not available.

EOI #65(a) (Otto-Canada) referenced only one existing 135 TPD plant in West Germany. EOI #71 (Env. Air) described a generic wet/dry system which would produce RDF bales which would be stored in air support structures before incineration.

**Summary - Group 1(a)**

The European Wet/Dry collection system is compared with the Blue Box system in Section 5.3, including a summary of the observations from the site visits by Metro which confirmed the



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reservations with respect to suitability of the European system at this time. However, due to the experience of Brini, the potential exists for these components to help achieve diversion of wastes in excess of the 50% target. The Nanaimo, B.C. project should continue to be monitored.

**Group 1(b) MRFs Which Process Mixed Wastes (excluding Blue Box material)**

EOIs proposed seventeen facilities and are summarized by the Process or Technology named and listed in Table 5.4.2.

Brini - This process is discussed in more detail in the previous section. EOI #3 (Advanced Ecology) proposes to process mixed Residential and Commercial/ Industrial waste with several 400 to 1200 TPD facilities using the Brini system. Materials recovered are 20% and are combined with composting to achieve 50% diversion. A 15% level of diversion by source separation (by others) is assumed by the respondent prior to the waste entering the proposed plant. The respondent is currently involved in the construction of a 160 TPD plant in Nanaimo, B.C.

Buhler-Miag - 3 EOIs, #6 (Buhler-Miag) #29 (Encomp), and #31 (Reuter) propose this process to take mixed residential and commercial/industrial wastes in 400 to 2,000 TPD facilities. Material recovery rates varied from 20-27% followed by composting to achieve 59-65% diversion.

Buhler-Miag is based in Switzerland and is an established manufacturer of a wide range of processing equipment. Over 100 waste processing facilities worldwide are claimed. Buhler-Miag (Canada) Ltd. is based in Toronto.

Two plants are referenced as MRF type facilities. The Falkenberg, Sweden facility claims to process 240 TPD of residential and commercial waste and began operation in 1981. The plant recovers only 5% metals before diverting 35% by composting and producing 40% RDF. A 470 TPD plant in Eden Prairie, Minnesota operating since 1986 is achieving 15-20% materials recovery. An additional 40% is being converted to RDF. Operational problems are minimal. Presently, a compostable fraction (20-25%) is recovered and is taken to a local landfill where it is formed into static piles, composted, and used for final cover. Reuter is in the process of siting a composting facility (scheduled for operation next year).



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Cal-Recovery - EOI #53 (ONTC) proposes to divert 51% by materials recovery and composting and to convert 15% to RDF.

Cal would select proven components of other processes, then modify designs to suite the waste stream characteristics and end markets of the GTA. Cal Recovery currently is involved in three MRF projects ranging from 20 to 40 TPD, as well as two composting projects, all of which are located in Minnesota. The company does not have any existing operating facilities.

Lundell - Four EOIs, #1 (Lamarche), #22 (Nera Bio), #34 (Notre), and #58 (Weldex) name this process. Suggested plant capacities range from 750 TPD to 4,000 TPD and process mixed residential waste only. Materials recovered from the MRF range from 8% to 33%. Subsequent composting of residual fractions resulted in total diversion percentages of 18 to 65 percent.

Lundell's manufacturing plant is located in Cherokee, Iowa and has traditionally produced farm equipment. The company diversified into waste processing and built its first 40 TPD plant in Thief River Falls, Iowa in 1985. The plant reportedly achieves 16% recovery of materials and 24% by composting; 50% is converted into RDF fuel pellets for a total diversion of 90% from landfill. An 80 TPD plant in Yankton, South Dakota began operation in December 1989 and reports 35% materials recovery followed by 50% conversion to RDF. Five other plants, varying in size from 25 to 75 TPD, came into operation during the past two to three years.

The process is highly automated and would be shipped to the customer in 100 TPD (12 hr day basis) modular process lines. Most MRFs are followed by an anaerobic in-vessel windrow composting process which is discussed in Section 5.5.

Mitsui - EOI #48 (Equity) proposes to process 12,000 TPD of mixed residential, commercial/industrial and construction and demolition waste in 3 facilities. A total of 52% is claimed to be recovered and when combined with composting can achieve 61% diversion of the waste processed. However, one-third of the waste is unprocessable and therefore diversion is approximately 41%.

Mitsui has no known North American experience but presently operates the 1500 TPD Dream Island facility in Tokyo and claims European installations. The process would be built in Canada and modified to adapt to GTA conditions.



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ORFA - EOI #46 (Agra Industries) claims 85% diversion through the production of a marketable end-product, as well as material recovery. Only 2 plants are proposed each with a capacity of 350 TPD due to some concern with finding suitable markets in the GTA for the end product. Until such markets can be established, this process should be monitored for future consideration.

Active R & D is being done by the proponent to advance the marketing of the Orfa product. A 120 TPD plant has just come on line in Philadelphia, PA., but performance rating is premature due to start-up and financial difficulties.

Pro-Cyss - EOI #63 (Pro-Cyss) claims a 58% diversion rate by materials recovery and composting with 37% being converted to RDF and/or recycled plastic and paper.

Two facilities, Ford County, Kansas and Vilas County, Wisconsin have design capacities of approximately 50 TPD. The Ford County plant operated from 1978 to 1988 and basically shredded and ground waste to reduce volume before landfilling. The Vilas County facility has been operating since March 1989 at approximately 25 TPD, employs manual handpicking and anticipates a 70% diversion rate when they begin composting. Operational problems have been related to large metal pieces jamming the shredding system. One 300 TPD facility is under construction in Hidago County, Texas.

Recomp - EOI #32 (Recomp) claims the ability to divert up to 30% by materials recovery and 40% by composting for a total diversion of up to 70%.

The referenced MRF plant in St. Cloud, Minnesota processes 50 TPD, has been operating since 1988 and claims to be achieving 70% diversion. The 50 TPD feedstock is received from a 400 TPD transfer station where some presorting may occur. No further details were available.

SEII - EOI #25 (Kilborn) proposes 14 plants at 720 TPD to divert 18% by materials recovery and an additional 50% by composting of mixed residential, commercial/industrial and construction and demolition wastes.

SEII constructed a material separation and recycling facility in Chalon Sur Marne, France in 1979, and is constructing another in Grenoble Concelin, France. A Kilborn official stated that this facility processes 15 TPH and that SEII equipment can be assembled in modular fashion to produce larger capacity facilities.



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Kilborn's involvement in the 800 TPD Downsville MSW facility may qualify them for a certain level of consideration by SWISC as a general contractor/designer. It should also be noted that Kilborn and SEII have not participated in a joint project before and SEII's largest MSW operating plant processes only about 150 TPD (one 10 hr shift basis at 15 TPH).

Sorain-Cecchini - EOI #67 (Laidlaw) proposes 5 plants rated at 4000 TPD to process mixed residential and commercial/industrial waste. Twelve percent of input will be recycled while 31% will be composted for a total diversion of 43%. A 25% level of diversion by source separation (by others) is assumed prior to the waste entering the proposed plant.

Only one Sorain facility is operating in North America and none are under construction, or planned. Their North American plant is located in Toronto, and is owned and operated by Domtar Paper. This plant was designed to recover corrugated cardboard from commercial waste. In Europe, however EOI #67 states that Sorain has constructed ten recycling and/or composting plants, and two more are planned or under construction. All but two of these plants have capacities greater than 200 TPD, and five are larger than 600 TPD. More recent installations incorporate one or two 28 TPH primary processing lines for recovery of plastic film, ferrous metal, paper, and in some cases organics for composting. Several of their earlier facilities have been shutdown or converted to transfer stations because the plastic and paper incinerators can no longer be operated due to Europe's new stringent pollution laws. Their Perudia and Cassino, Italy facilities, which should soon begin operations, incorporate Sorain's latest technology. Sorain claims that computer technology installed at these facilities enables them to process 200 TPD with as few as two operators. In the U.S., Sorain is involved in a 1650 TPD North Country recycling and energy recovery facility in San Marcos, California. However, this project has been indefinitely delayed due to environmental regulatory concerns about the plant's emissions.

Two other EOIs #6 (808106 Ont.) and #61 (NRI CNR/Bechtel) propose generic systems and therefore could not be evaluated against the proven criterion.

In general, Sorain's European plants have a large number of operating hours and tons processed, giving them an operational experience base to build upon.

Two other EOIs #6 (808106 Ont.) and #61 (NRI CNR/Bechtel) propose generic systems and therefore could not be evaluated against the proven criterion.



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**Summary - Group 1(b)**

The general technology represented in this group is viable for further consideration. The Brini, Buhler, Lundell, Mitsui and Sorain Cecchini processes appear to be the most capable of meeting SWISC requirements. While the largest currently operating plant capacities reported by the respondent approached 1500 TPD (Mitsui), the majority were sized from less than 100 up to 200 TPD. Furthermore, most of the larger operations were located in Europe or Japan. The Reuter plant in Minnesota at 470 TPD is one of the more promising installations handling a waste stream which is likely to be similar to the GTA.

Respondents who propose to process more than 50% of the GTA waste stream indicate plant sizes from 400 to 4000 TPD located at 3 to 10 sites. The ability to scale up and site the proposed facilities to meet the needs of the GTA has not been previously attempted.

Based on the information provided by the EOIs, it appears that the 50% diversion target is attainable by a combination of materials recovery and composting. A wide variance of recovery through MRFs and Composting processes were reported, however. Of particular interest was the number of respondents (11 out of 17) proposing the production of RDF to achieve further diversion from landfill.

Based on the above observations, it can be concluded that while the proposed technology is not proven on the scale of the GTA, the potential exists for this type of facility to achieve 50% diversion.

**<u>GROUP 1(c)</u> - MRFs Which Process Mixed Wastes (without any source separation).**

Only two processes are listed in Table 5.4.3.

EOI #7 (Cogenesis) claims 53% diversion is achieved before the waste is processed in a pyrolytic thermal treatment plant.

Cogenesis proposes to provide long-term waste management to the GTA in the form of a resource recovery/composting system built by SPM Group Corporation of Kansas, and/or a separate McMullen pyrolizer built by Py-Co-Gen Corporation of Irma, Wisconsin. Cogenesis



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claims that their present corporate entity has no relevant experience in the composting or recycling business.

SPM Resource Recovery is a company that designs and markets technology and equipment for the conversion of MSW into recycled products, compost, and RDF. SPM Resource Recovery listed four projects including two MSW recovery/composing facilities, a tire processing facility, and a building debris/wood waste processing facility.

A material recovery/composting facility in Preston County, Minnesota is averaging approximately 15 TPD. This facility has been in operation since 1988. Waste processed at the facility includes residential and commercial solid waste and source-separated recyclables. According to County staff, during the first year of operation, approximately 16 percent of delivered material was recycled, with another 17 percent composted and given away to local farmers. No significant operational problems were reported.

The second material recovery/composting facility listed by SPM is a 230 TPD plant in the planning stages in Council Bluff, Iowa.

EOI #44 (Trican) claims 32% Diversion followed by production of RDF using recovery equipment by National Recovery Technologies (NRT). Two facilities were referenced in Crestwood, Illinois and Long Island, New York. Both facilities are permitted at 400 tons per day (TPD) and both have just recently started operating with the Crestwood facility operational since December 1989.

Materials are recovered from residential waste at the Crestwood, Illinois facility. All materials recovered currently are marketed in the Chicago area. Garden waste and grit (including mixed crushed glass) is also separated but is currently landfilled. According to Crestwood staff, this material will be composted in spring of 1990 and used for landfill cover. Landfill diversion rates are estimated at 25% with 75% of process input material being landfilled.

The Long Island, New York facility has been shut down for modifications and adjustments. It was scheduled to start up again at the end of February 1990 and begin processing residential solid waste.



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**Summary - Group 1(c)**

The concept of elimination of the source separation of wastes prior to processing as represented by these EOIs is contrary to the basic policy of reduction and separation at the source adopted by Ontario. Therefore, this type of facility is not recommended as proposed. The technologies, however, could be monitored with respect to their suitability for recovery of materials from wastes separated remaining after source separation.

### 5.4.2 Group 2 - MRFs Which Process Wastes Separated at Source

This group of MRFs includes those which require a portion of the waste stream to be separated at the source. Seven EOIs were submitted and their key features are summarized in Table 5.4.4.

EOI #9 (Foster Wheeler) specifies source separation of metals, glass, plastics, paper and yard waste before the waste enters the facility. A MRF by Resource Recovery Systems (RRS) will process residential and commercial/industrial waste diverting 27% before a mass burn EFW plant.

RRS has been providing source separated recycling facility design, construction, operation and marketing assistance for the past 14 years. Five projects are listed including a plant in Camden, New Jersey (1986) which is designed to process 80 TPD. More recently a 95 TPD commingled bottles and cans operation, including a 145 TPD paper recycling plant, is undergoing performance testing in Springfield, Massachusetts. The company is also paired with Foster Wheeler to provide a 600 TPD recycling facility for the island of Montreal.

EOI #26 (Igloo) propose a collection system and processing facility. The collection system is designed to capture source separated paper, bottles and cans (and possibly batteries) in public areas or areas where a residential or commercial/industrial source separation program is not in place. Igloo estimates that up to 5% of the waste stream can be captured with this method.

From 1977 to 1989, six systems in West Germany and one in the U.S., ranging in size from 82 to 450 TPD, were installed. Halton is currently testing this system.



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EOI #42 (BFI) proposes to divert 32% by materials recovery before the residual is disposed of in EFW (unspecified) and landfill.

BFI is experienced in commercial and industrial collection and source separated recycling systems. Thirteen systems from 5 to 400 TPD are existing or planned including Edmonton, Alta at 65 TPD and a 400 TPD industrial waste process pianned for Windsor in 1990.

EOI #55 (Dual Env.) is planning a 1500 TPD facility to be located in Toronto to recover 58% of the construction and demolition waste which would enter the proposed plant. The plant is expected to be in operation in the fall of 1990. A building permit has not been issued, however, discussions with the MOE are claimed. This EOI could also be included in Group 3. No existing operations were referenced.

EOI #65(b) (Halton-Otto), in association with #65(a) (Otto-Canada), proposes a 150 TPD facility in Halton to process source separated commercial/industrial waste. Plans to expand to the other regions were indicated.

Otto operates five existing plants in West Germany sized from 95 to 200 TPD.

EOI #72 (Markham/Miller) proposes 3 separate plants. One plant will process 4500 TPD of source separated industrial, commercial/industrial and construction and demolition waste. This EOI is discussed in more detail in section 4.3. The respondent claims the ability to diver 60% from disposal. Few details on the experience of Recovery Systems Technology Inc. (RSTI) or other proposed vendors were provided.

EOI #77 (Montenay-Atlantic) will process residential and commercial/industrial waste separated into dry paper and wet organics. Diversion of 68% is claimed by recovery and composting with the residual being disposed of in an EFW operation.

Montenay is an experienced EFW supplier while Atlantic Packaging has operated a 540 TPD commercial source separated paper recycling plant in Metro for several years. No existing plants are referenced for composting.



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EOI #78 (Ogden Martin) proposes 3 MRF facilities by Bezner of West Germany to divert 29% of incoming materials. Twelve sorting plants in West Germany and Denmark sized from 70 to 200 TPD are referenced from 1984 to 1989. One U.S. plant located in Rhode Island, operated by New England CRInc, has been operating successfully since April 1989 and recently increased capacity to 170 TPD.

**Summary - Group 2**

As separation at the source is integral to the basic policy adopted in Ontario for recycling and waste management, facilities to process source separated commingled waste are essential to the success of the program. Many EOIs, #9 (RRS) #26 (Igloo), #42 (BFI), #77 (Montenay-Atlantic) and #78 (Ogden Martin), propose source separated MRF technology with significant operating experience.

Systems have already been, and continue to be developed in the GTA to receive, and process for marketing, those materials delivered from Blue Box and source separated wastes streams. This type of facility is being considered in the 3Rs Action Plan for any means of improving the capacity and efficiency of existing systems.

### 5.4.3 Group 3 - MRFs Which Process Specific Materials

This group of MRFs includes those which process specific materials only; such as drywall, wood, tires, food waste and plastics. Also included in this group are those which process construction and demolition waste and can include a number of specific materials that may or may not be separated before entering the facility.

- Wood

  - EOI #37 (Wood Waste Solutions) estimate that more than 300,000 TPY of recoverable wood wastes are dumped annually in Metro landfill sites. Their existing facility in Mississauga currently handles 30 TPD, of which 60% is reclaimed and re-used and the other 40% is processed and marketed as a feedstock for paper, construction products, particle board and wood chip mulch. It is proposed to expand this facility to 40,000 TPY. In addition, their Weston facility is proposed to be operational by early 1990, also



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with a capacity of 40,000 TPY. They propose 3 locations by 1990 and 10 locations province-wide by 1995, each with a capacity of 40,000 TPY.

- EOI #56 (Chasson Pallets Ltd.) commenced operations in 1989 at Port Perry, Ontario and accepts 20 TPD. They claim market commitments for up to 40,000 TPY and propose a total capacity of 60,000 TPY at several locations. Markets are similar to #37 above.

No specific process details are provided but it is evident that these companies are already responding to a market demand. Support for this potential diversion could be provided by SWISC through the ban of wood wastes from disposal as soon as processing facilities are available. Peel instituted its wood ban in December 1989 upon the opening of Wood Conversions Inc. All wood with the exception of demolition wood is banned from Peel landfill and transfer sites.

- Drywall

- EOI #12 (Noel De Sautels) proposes a collection and transfer system to recycle drywall by collection and sorting to ensure quality control prior to delivery to drywall manufacturers. The manufacturers have the facilities in place to incorporate the recycled material into the manufacturing process. 95% recovery is projected from facilities to process 50,000 TPY.

Both Metro and Peel are instituting bans on drywall material from construction sites as of 1 May 1990. Material is to be directed to New West Gypsum in Oakville or to Waste Mgt./Domtar depots to be located throughout the GTA. The market place is therefore, already driving this aspect of recycling as a result of these bans.

- Construction/Demolition

- EOI#15 (Expocrete Ltd.) proposes to process source separated construction and demolition waste to recover concrete, asphalt, brick masonry, metals and wood, based on processes used in the quarrying and aggregate processing industries. They project 100% recovery rates from an 800 TPD facility potentially located in Flamborough. In addition they propose the composting of leaves and brush in a 30 TPD facility.



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- EOI #45 (Wastestreams Systems) proposes to separate construction materials to recover wood, concrete, brick, roofing, drywall and metals, based on their experience in the demolition of the Goodyear plant in Etobicoke. They project:
  - 150 TPD from commercial/industrial sources with 95% Diversion
  - 1289 TPD from construction/demolition sources with 85% Diversion and
  - 250 TPD from landscape/forestry resources with 98% Diversion for a total diversion of 1,484 TPD

Markets are claimed and equipment can be assembled as soon as an agreement is reached to locate the facilities on existing landfill sites. (This may be a problem with respect to actual space available and is being checked by the Regions.)

In addition they propose soil cementation of nonregisterable material to make it suitable for inert filling operations. Further investigation is required to confirm the acceptability of this process which may also be a potential solution for some of the wastes which are not presently disposed of in landfill.

EOIs #42 (BFI); #55 (Dual Env); #72 (Markham/Miller) which were included in Group 2 also propose to process construction and demolition wastes.

The quantity of Construction/Demolition waste estimated as going to Metro landfill sites is only in the order of 1,000 TPD. This may be low and/or the Respondents' estimates are high. In any case these facilities would reduce the total waste stream by up to 4%.

- Tires

- EOI #58 (Weldex) includes an equipment proposal from CSI describing a Thermal Screw Press which is capable of processing several specific materials including wood, drywall, roofing shingles, plastics, medical waste, agricultural materials and tires.

This equipment has been in use in Toronto (for shredding scrap tires at 40 TPD) since June 1988 and for densifying international waste at Pearson airport since 1987. It has also been used for the production of animal feed in Europe for several years. Many other applications identified by CSI were part of ongoing test programs. Marketability of many of the products is to be determined.



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Several other EOIs referred to the ability or possibility of recycling or disposal of tires. These include:

- EOI #4 (Dynavest), #7 (Cogenesis) and #17 (WDT Can.) are thermal disposal processes which claim the ability to process rubber or tires.

- EOI #60 (Enviro) includes several references to the possibility of processing tires.

- EOI #25 (Kilborn) indicates that it is currently developing a process to handle tires however, no further details were provided.

- EOIV #35 (Enviromax) references a tire processing facility in Gammi Mayer, Germany which has been operating for 20 years and also a tire "crumbling" process.

- EOI #22 (Nera Bio) references a tire-freezing process which shatters the tire.

- EOI #51 (WMI) refers to a tire shredding module as part of their proposal however, no further details are provided and as an alternative, a cryogenic (freezing) process which crumbles or shatters the tire.

- EOI #22, #35, #51 and #60 have been referred to the 3Rs Action Plan. EOIs #4, #7 and #17 are discussed in Section 6.5 and relate to thermal disposal. EOI #25 is in the development stage and therefore is referred to R & D.

• <u>Food Waste</u>

- #38 (Redipac) currently processes 400 TPD of food and health care wastes in Toronto and intends to add an additional 1200 TPD in September 1990. Products are sold as semi-processed or finished, composted by vermicomposting to produce fertilizer or sold as a feedstock to the agriculture sector.

• <u>Plastics</u>

- Two EOIs #58 (Weldex) and #38 (Redipac) discuss the processing of mixed plastic waste to produce a usable product. #38 (Redipac) has examined processes from Ireland,



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Belgium, Switzerland and Germany and is proposing to construct a plastics recycling facility. No details were provided.

**Summary - Group 3**

One specific material components generally have existing facilities or locations coming on stream in the very near future. In most cases, machinery and markets exist for these materials, therefore facilities should proceed as soon as possible and as part of the SWISC 3Rs Action Plan.

### 5.4.4 MRFs as an Integral Part of Disposal or Composting Facilities

Fifteen EOIs that primarily involve composting and disposal processes (excluding landfill), also indicate the recovery of a small percent of materials. These are considered under the disposal or composting components these are associated with but are identified below for their recovery capabilities.

#2 - (Westinghouse Res.): estimated to recover 0.6% of 10,070 TPD feed materials with a ferrous recovery system at the tail-end of the EFW process.

#4 - (Dynavest): estimates a 13% recovery rate prior to thermal processing of waste.

#5 - (St. Lawrence Cement): will receive 250,000 TPY of materials after blue box recovery and would recover 4% of total input in the form of ferrous. Also will consider additional materials recovery.

#17 - (Waste Distillation): magnetic separation prior to incineration; no percentage given.

#18 - (WPF/BLI Corp.): magnetic separation prior to composting; no percentage given.

#19 - (Kenox Corporation): metals, glass and other inorganics are to be separated prior to wet oxidation; no details given.

#24 - (Environmental Disposal): material separation process for corrugated cardboard, metals and plastics prior to composting and RDF; no details given.



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#35 - (Enviromax Corp.): recovery system prior to EFW suggested, no details given.

#50 - (Alternative Env): magnetic separation prior to size reduction, no details given.

#64 - (Wastech): front-end recovery before incineration; no details given.

#66 - (Pattison): ferrous recovery (at the end of EFW process); no details given.

#68 - (IGC Co-Gen Ltd.): front-end recovery system proposed before incineration

#69 - (MSW Recycling): front-end recovery (after Blue Box) of plastic, metal, glass before composting of organics.

#73 - (Surety): front-end recovery before incineration; no details given.

#76 - (Muscillo): front-end possible composting before incineration; no details given.

**Summary - MRFs Integral to Disposal or Composting**

It is likely that many of these recovery processes would not be necessary since separate materials recovery facilities such as those described by Groups 1 to 3 would be in place. Should a disposal facility proceed before an MRF is in place, this type of facility should be considered.

5.4.5 Screening of Components - Mechanical Recovery Facilities (see Section 2)

Step C.1: Mandatory Criterion

Each response was evaluated for its ability to meet the mandatory criterion under this category: Proven success of operation at a scale suitable for the GTA.

Mechanical processing for the recovery of recyclables from mixed solid waste is a relatively new procedure. In North America weak, limited end markets have demanded high quality, thoroughly processed products which have netted a fairly low, fluctuating price for the collector/processor. This situation demanded that recyclables be recovered by source separation and be processed manually to ensure limited contamination.



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The emergence of high tipping fees, government legislation and funding, public awareness and commitment, and private sector expansion and involvement has resulted in source separation Blue Box programs, with processing Group 2 type, Materials Recovery Facilities.

Mechanical recovery has been in existence in Europe for many years. Lack of raw materials has driven markets to be far more lenient in their quality classifications and has allowed for mechanical processes to take a leadership role in materials recovery.

The commitment for reuse, reduction and recycling in North America is beginning to allow markets to expand, and adapt, (or at least catch up), to the abundance of new raw material substitutes available to their manufacturing processes. Mechanical recovery processes are now being adapted and adjusted to meet the variation in wastestreams and the low contamination levels demanded by the market place.

The main trouble in evaluating the proven successes of any of these processes is the lack of any past histories comparable to the GTA. There are no comparable systems with the same waste input, i.e. the same municipal solid wastestream, the same local market restrictions, the same source separation programs already in existence, etc.

Many outside influences must be examined when evaluating the proven successes of an operation and its abilities to meet the needs of the GTA. Further investigation and research must be done to properly evaluate these processes. Although not meeting the proven criterion, several MRF processes have shown leadership and have proven themselves at varying levels. They should be further examined as potential, major, processes for materials recovered within the GTA. These processes are:

Group 1:
Lundell, EOI #1, #22, #34, #58
Brini, EOI #3, #51
Buhler, EOI #6 #29, #31
Mitsui, EOI #48
Sorain, EOI #67

Group 2:
RRS, EOI #9
Igloo, EOI #26
BFI, EOI #42
Montenay-Atlantic, EOI #77
Ogden Martin, EOI #78



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Group 3:
The EOIs described in this group should be pursued as part of the 3Rs Action Plan to encourage the early implementation of the facilities proposed.

Others have shown limited abilities and could be further investigated as potential, minor, processes for specific areas and/or specific materials within the GTA. Still others must provide further proof of their abilities to be considered as a potential process for the GTA.

Step C.2: Three important factors: The second step in the screening process was to address the following three factors.

This was done for each of the EOIs. However, because of the lack of specific siting information, a comparison of the specific EOIs could not be accomplished. Instead the important factors are considered on a generic basis for MRF facilities.

- demonstrated ability to meet environmental requirements

The recovery of recyclables through mechanical processes does not incur many environmental restrictions or requirements. Most systems can be sited in industrial areas and would have the same requirements as those of a transfer facility. The facilities would be enclosed as part of their basic design which allows mitigation of noise, dust, litter etc. The main environmental concerns are generally those associated with traffic and public perception. To process mixed waste, a waste management certificate is normally required.

- flexibility of the component to incorporate future developments

Almost all EOI respondents have proposed mechanical processes that are a combination of a few main components that can be scaled up or down to meet the varying amounts of input. Systems are designed in a modular form and can be expanded, decreased, adapted or adjusted to incorporate developments or to meet market changes. Manual labour, as well as mechanical modules, can be added to increase the number of materials recovered as markets develop.

The buildings required to house the facilities may also be designed with flexibility for other uses.



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- Operations by 1996

All mechanical systems proposed can be operational by the year 1996; most can be sited and constructed within two years from the date of approvals. Siting is the key to timing

**Summary**

With proper design relative to facility size and siting, MRF facilities can be provided to meet these three important criteria.

Step C.3: "Common Criteria and Specific Criteria" (Table C.3)

Evaluation of each EOI was attempted but in the absence of specific details and sites, this was unsuccessful. Additional information was requested with respect to the proven criteria and the % breakdown of specific diversion materials to distinguish RDF from materials and components. The comments below highlight the important features of MRF specific to each major criterion.

A. Human Health and Safety

The facility can be designed to avoid significant net effects for each of the criteria in this category through enclosure of the facility. The actual site and size will govern impacts from traffic. Particular attention would have to be paid to worker safety.

B. Natural Environment

Facility location in industrial areas will normally avoid impacts on the Natural Environment.

C. Social/Cultural

Site location would conform to local land use planning and the necessary local infrastructure should be available.

Public acceptability for this type of facility should be more readily achievable than for other waste processing facilities.



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D. Technical

If properly designed, the facility should lend itself to adaptation for improvements in the technology and flexibility within a total system.

E. Planning Framework

There is insufficient experience to predict the normal life of MRF, but with regular maintenance and replacement of components a lifetime of 15-20 years would be anticipated. The modular nature of the processing units allows flexibility. At the present time, the facility could be processed under EPA approvals if the residues did not exceed 200 TPD and constructed within 12 months following approvals.

Specific Criteria

Percentage diversion by year was not addressed specifically in the EOIs which indicated full achievement from startup. It could be anticipated that less would be achieved while the facility was being started up, with gradual increase on refinements to the process and as markets were established.

Method of measurement was generally assumed to be by weighing incoming material and product streams.

The type of end product and its marketability was an area where most respondents were unable to be clear and/or committed. Most have addressed how material will be processed for sale, but many have not compiled market research or supplied market commitments. This is partly due to the fact that many present markets avoid agreeing to commitments on a long term basis. The questionnaire addressed this area and 10 respondents stated that markets had either been researched and/or commitments had been made. Only 3 respondents, #38 (Redipac), #45 (Wastestreams) and #58 (Weldex) stated that they had market commitments for all their materials.



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**Summary**

Because of the significance of MRF in achieving the diversion target, these systems identified as having the most potential for the GTA should be developed progressively to establish the most appropriate system for the GTA.



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Table 5.4.1
Group 1(a)
MRFs Which Process Mixed Waste From Wet/Dry Collection

| EOI # | Responden | Process | INPUT TPD | % of GTA | | DIVERSION MRF TPD | % Rec. | Compo TPD | % Rec. | Total Recovered TPD | % | DISPOSAL RDF % | EFW % | Land % | Plant Information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | WMI | Brini | 20276 | 100 | Res<br>C/I<br>C&D | 13830 | 68.8 | 964 | 100 | 10479 | 51.7 | | 38.3 | 10 | - Size and # of plants as required, 3 sep. modules<br>- EFW by Wheelabrator<br>- Option to produce RDF |
| 65a | Otto-Can | Otto | 20276 | 100 | Res<br>C/I<br>C&D | 14124 | 62 | 6140 | 70 | 13078 | 64.5 | | | 35.5 | - 17 MRFs @ 600 TPD,<br>- 2 C&D MRFs @ 2000 TPD<br>- 17 composting plants @ 361 TPD |
| 71 | Env. Air Structures | Env. Air Structures | 20276 | 100 | Res<br>C/I<br>C&D<br>HHW | 17276 | 34 | 3000 (by others) | 93 | 8685 | 43 | 57 | | | - RDF stored in bales or landfill covered by air structures<br>- No details on MRF to determine proven |

Table 5.4.2
Group 1(b)
MRFs Which Process Mixed Waste (excluding Blue Box material)

| EOI # | Respondent | INPUT Process | TPD | % of GTA | | DIVERSION MRF TPD | % Rec. | Compos TPD | % Rec. | Total Recovered TPD | % | DISPOSAL RDF % | EFW % | Land % | Plant Information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Lamarche | Lundell | 4000 | 20 | Res | 4000 | 10 | 600 | 100 | 1000 | 25 | 25 | | 50 | - One plant proposed @ 4000 TPD |
| 3 | Advanced Ecology | Brini | 11538 | 57 | Res C/I | 11538 | 20 | 3648 | 95 | 5772 | 50 | 30 | | 20 | - 400 - 1200 TPD plants as required<br>- Assumes 15% diversion by source separation (by others) prior to waste entering plant |
| 6 | Buhler-Miag | Buhler-Miag | 12490 | 61 | Res C/I C&D | 12496 | 20 | 4733 | 100 | 7304 | 59 | 9 | | 32 | - 6 to 10 plants proposed |
| 22 | Neva Bio Energy | Lundell | 750 | 4 | Res | 750 | 20 | 337 | 100 | 487 | 65 | 15 | | 20 | - one plant @ 750 TPD proposed<br>- mass balance on system unclear |
| 25 | Kilborn | SEII | 14000 | 69 | Res C/I C&D | 14000 | 18 | 7000 | 100 | 9540 | 68 | 31 | | 1 | - 14 plants @720 TPD |
| 29 | Encomp | Buhler | 8625 | 42 | Res C/I | 8625 | 22 | 3750 | 100 | 5633 | 65 | | | 35 | - 6 to 8 plants @ 400 - 2000 TPD |

Table 5.4.2
Group 1(b)
MRFs Which Process Mixed Waste (excluding Blue Box material)

| EOI # | Respondent | Process | INPUT TPD | % of GTA | | DIVERSION MRF TPD | % Rec. | Compos TPD | % Rec. | Total Recovered TPD | % | DISPOSAL RDF % | EFW % | Land % | Plant Information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | Reuter of Canada | Buhler (modified) | 6000 | 30 | Res Com | 6000 | 27 | 2058 | 100 | 3662 | 61 | 28 | | 11 | - 6 facilities @ 1000 TPD |
| 32 | Recomp | Recomp | 7000 | 34 | Res C/I | 7000 | 30 | 2800 | 100 | 4900 | 70 | | | 30 | - 7 x 1000 TPD |
| 34 | Notre | Lundell | 3800 | 19 | Res | 1900 | 8 | 530 | 100 | 682 | 18 | 23 | | 59 | - 1 to 2 plants proposed |
| 36 | 808106 Ontario Inc. | Generic System | 13179 | 65 | Res C/I | 13179 | 13 | | | 1713 | 13 | | 78 | 9 | - Note: EOI assumes 35% recovery from Blue Box (by others) therefore total diversion is 48% |
| 46 | Agra | Orfa | 700 | 4 | Res C/I | 700 | 85 | | | 595 | 85 | | | 15 | - 2 x 350 TPD plants |
| 48 | Equity | Mitsui | 12000 | 59 | Res C/I C&D | 8000 | 52 | 720 | 100 | 4920 | 41 | 6 | | 33 | - 3 x 4000 TPD plants (4700 TPD design)<br>- RDF could also be composted for Biogas<br>- Note: EOI assumes 40% diversion (by others) in 1992 therefore total diversion is 81%. |

Table 5.4.2
Group 1(b)
MRFs Which Process Mixed Waste (excluding Blue Box material)

| EOI # | Respondent | Process | INPUT TPD | % of GTA | | DIVERSION MRF TPD | % Rec. | Compos TPD | % Rec. | Total Recovered TPD | % | DISPOSAL RDF % | EFW % | Land % | Plant Information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 53 | ONTC | Cal Recovery | 8000 | 40 | Res C/I C&D | 8000 | 16 | 2800 | 100 | 4080 | 51 | 15 | | 34 | - 2 plants @ 4000 TPD<br>- Note: assumes an unidentified level of diversion by Blue Box |
| 58 | Weldex | Lundell | 2000 | 10 | Res | 2000 | 33 | 600 | 100 | 1260 | 63 | 27 | | 10 | - 4 plants @500 TPD |
| | | Catrel | 3200 | 16 | Res | | | | | 0 | 0 | 90 | | 10 | - 4 plants @ 800 TPD |
| | | IRS | 2000 | 10 | C&D | 2000 | 85 | | | 1700 | 85 | | | 15 | - 2 plants @ 1000 TPD |
| | | TOTAL | 9200 | 46 | | 4000 | 59 | 600 | 100 | 2960 | 32 | 37 | 3 | 28 | |
| 61 | CN/ Bechtel | to be chosen | 10538 | 52 | Res C/I | 10538 | 25 | | | 2635 | 25 | | | 75 | - 1 plant proposed |
| 63 | Royaledge | Pro-Cyss | 15300 | 75 | Res Com | 15300 | 22 | 5500 | 100 | 8874 | 58 | 37 | | 5 | - 14 plants @ 900 to 1200 TPD |
| 67 | Laidlaw | Sorain | 15707 | 75 | Res C/I | 15207 | 12 | 4844 | 98 | 6572 | 43 | | | 57 | - 5 plants @ 4000 TPD facilities @ 400 TPD<br>- Note: EOI assumes 25% recovery from Blue Box (by others) therefore |

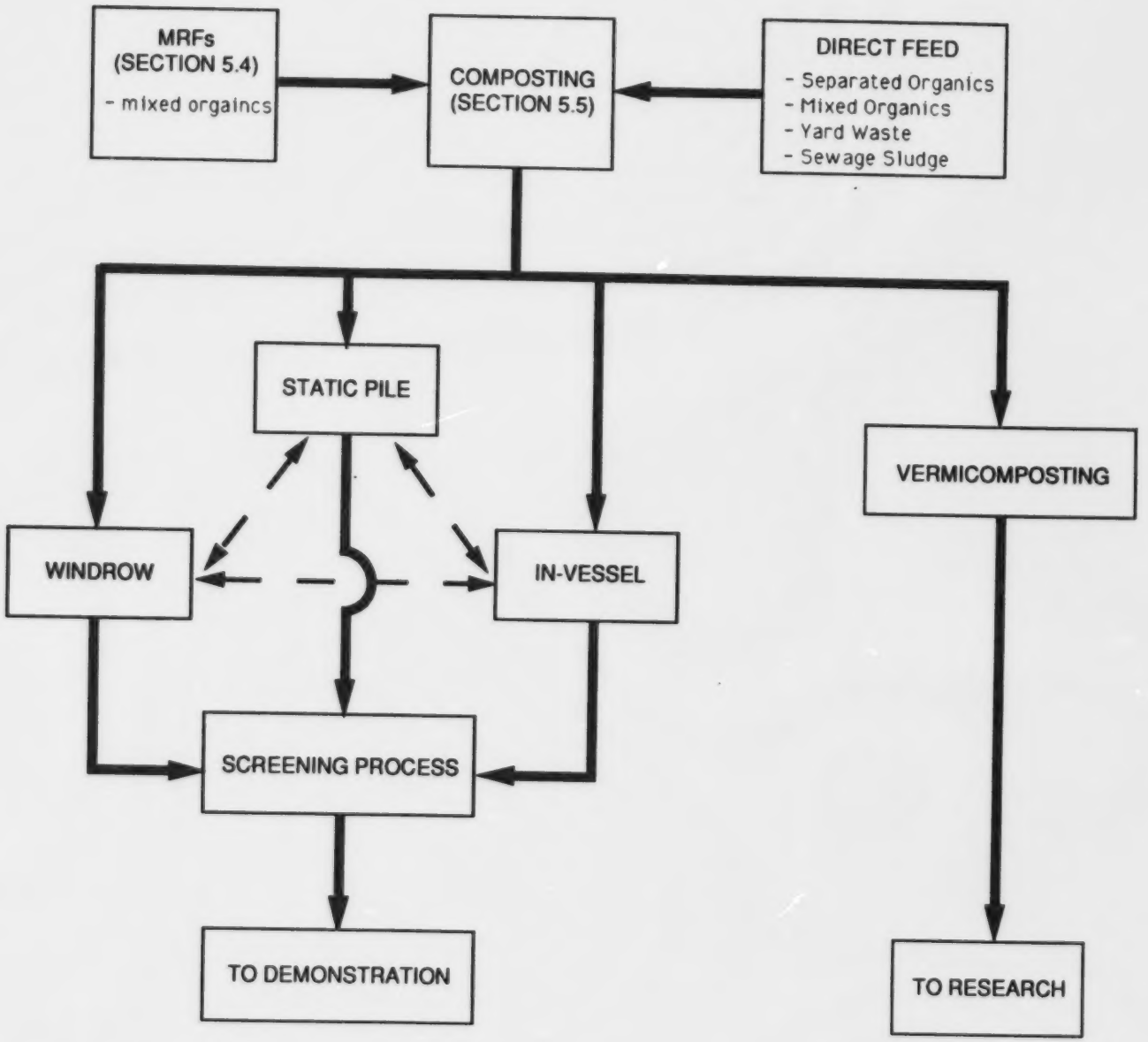
Table 5.4.3
Group 1(c)
MRFs Which Process Mixed Waste (no source separation)

| EOI # | Respondent | Process | INPUT TPD | % of GTA | Source | DIVERSION MRF TPD | % Rec. | Compos TPD | % Rec. | Total Recovered TPD | % | DISPOSAL RDF % | EFW % | Land % | Plant Information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | Cogenesis | SPM Resource Recovery | 20276 | 100 | Res C/I C&D | 20276 | 30 | 6083 | 75 | 10745 | 53 | 30 | | 17 | - 78 plants @ 250 TPD |
| 44 | Trican | National Recovery | 20276 | | Res | 20276 | 24 | 2129 | 80 | 6596 | 32 | 20 | | 48 | - 25 plants @ 800 TPD |

Table 5.4.4
Group 2
MRFs Which Process Source Separated Waste

| EOI # | Respondent | Process | INPUT TPD | % of GTA | Source | DIVERSION MRF TPD | % Rec. | Compos TPD | % Rec. | Total Recovered TPD | % | DISPOSAL RDF % | EFW % | Land % | Plant Information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Foster Wheeler | Resource Recovery | 10217 | 50 | Res C/I | 10217 | 20 | 1020 | 95 | 2808 | 27 | | 47 | 26 | - 3 plants @ 3406TPD<br>- 3 boiler facilities assumed |
| 26 | Igloo | Igloo | 1014 | 5 | Res C/I | 1014 | 90 | | | 920 | 90 | | | 10 | - 1 plant to process waste from Igloo |
| 42 | BFI Ltd. | BFI Recycleries | 10341 | 51 | C/I C&D | 10341 | 32 | | | 3309 | 32 | | | | - 10 plants @ 1000 TPD<br>- composting option |
| 55 | Dual Envir't | Dual | 4055 | 20 | C&D | 4055 | 58 | | | 2372 | 58 | | | 42 | - 5 plants proposed<br>- one plant scheduled for completion in Sep/90 |
| 65b | Halton-Otto | Otto | 150 | 1 | C/I | 150 | 95 | | | 150 | 95 | | | | - 1 plant for cardboard and paper |
| 72 | Markham Miller | RSTI Van Dyk Baler | 9813 | 48 | Res C/I C&D | 9813 | 60 | | | 5847 | 60 | | | 40 | - 1 @ 4500 TPD for source sep. Res. C/I and C&D<br>- 1 @ 5500 TPD for MSW<br>- 1 @ 1500 TPD for C&D |
| 77 | Monteray Atlantic | MAPP | 6350 | 31 | Res C/I | 2800 | 100 | 1750 | 100 | 4550 | 72 | | 28 | | - One plant for source sep. dry paper, wet organics |
| 78 | Ogden Martin | Bezner | 13889 | 68 | Res | 3979 | 100 | | | 3979 | 29 | | | | - 3 MRF @ 1400 TPD |
| | | | | | C/I | 9910 | 2 | EFW plants | | 200 | 1 | | | | - 3 EFW @ 3300 TPD |
| | | | | | | | | | | 4179 | 30 | | 70 | | |

**FIGURE 5.5.1: COMPOSTING**



## 5.5 COMPOSTING - DESCRIPTION AND SCREENING

### 5.5.1 Composting Methods

The composting process consists essentially of either aerobic (requires oxygen) or anaerobic (in the absence of oxygen) digestion of the organic fraction in waste to form a humus-like material by a biological process. The by-products are carbon dioxide, ammonia, sulfides and water. The process (aerobic or anaerobic) raises the temperature of the composting mass to 50°-75°C (prevailed over a period of approximately 3 days), thereby destroying almost all pathogenic organisms, fungal plant diseases, insects and weeds.

Composting operations accelerate natural organic decomposition by carefully controlling the chemical and biological parameters which influence the material's decomposition rate. Generally, control of the composting process is difficult since the waste stream can vary widely in content, and seasonal fluctuations can affect moisture and temperature levels.

The more important design factors which can be controlled to accelerate the composting operation are:

- moisture content
- particle size and structure
- temperature
- acidity
- inoculation
- carbon/nitrogen ratio
- aeration
- mixing
- nutrients
- size and shape of the composting mass

These parameters combine to determine the overall time required for composting to take place.

There are three systems that have been actively used for the production of compost, namely, Windrow; Static Aerated Pile; and In-Vessel. Table 5.5.1 summarizes the advantages and disadvantages of these methods.

Another system that is proposed by EOIs #38 (Redipac) and #48 (Equity) is the production of compost through digestion carried out by worms, or vermicomposting. Research is being



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conducted to determine the volumes and types of materials that are most suitable as worm feed. Vermicomposting has been proven in backyard composting units, and in small scale research facilities, however, there is a need to investigate its suitability on the GTA scale.

TABLE 5.5.1

SUMMARY OF EXISTING METHODS OF COMPOSTING

| | Advantages | Disadvantages |
|---|---|---|
| Windrow System | | |
| - open outdoor system that is controlled by turning frequencies<br><br>Active phase - 3 to 5 weeks<br>Curing phase - 3 to 14 weeks | - simple<br><br>- low capital investment<br><br>- no physical structures, can adapt to input fluctuations | - requires careful control of turning frequencies<br><br>- suffers from uncontrollable weather conditions: most are under roofs; open air<br><br>- large area required 875 - 2000 T/acre |
| Static Aerated Pile | | |
| - stationary pile placed over a bed of perforated pipe attached to an air blower<br><br>Active phase - 3 to 4 weeks<br>Curing phase - 3 to 14 weeks | - can alternate blowing and suction for best aerated system<br><br>- insulation blanket to control odours<br><br>- some MSW can be used as bulking agents<br><br>- good temperature and moisture control | - has been used mainly for sewage sludge<br><br>- air tends to dry out centre of pile<br><br>- needs bulking agents which can be costly, (wood fibres or chips)<br><br>- large land requirements |
| In-Vessel System | | |
| - an enclosed reactor or vessel<br><br>3 basic designs<br>1 - included rotary drum<br>2 - horizontal & vertical silo<br>3 - agitated horizontal bed<br><br>Active phase - as little as one day<br>Curing phase - up to 3 weeks | - greater production flexibility and control<br><br>- year round operation<br><br>- uses less land than other methods<br><br>- excellent odour control<br><br>- can process a wide variety of wastes | - higher capital costs<br><br>- require some land for curing<br><br>- higher maintenance costs<br><br>- less proven than other systems |



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### 5.5.2 EOIs Received

A total of 33 EOIs offered composting as a method of diverting the organic fraction of largely residential, commercial/industrial but also some construction and demolition waste streams from disposal. Level of detail within the EOIs varied from exhaustive descriptions of complete composting processes to a single statement explaining that composting will be undertaken.

Of the 33 composting EOIs received, 20 EOIs were proposed in conjunction with a MRF (see Table 5.5.2). Nine of the MRF-related facilities would compost only the organic residue or fraction from the MRF directly, while some facilities would mix the organic fraction with source separated yard waste (10 EOIs); "wet" household organics (6 EOIs); and/or sewage sludge (8 EOIs).

Source separated organic waste and mixed residential waste not processed in conjunction with a MRF would form the feedstock in 12 EOIs (see Table 5.5.3). The feedstock could be composed of: yard waste (9 EOIs); wood chips (3 EOIs); sewage sludge (2 EOIs); "wet" household (6 EOIs) and/or mixed residential fractions (3 EOIs). EOI #9, #30 and #51 would compost only source separated yard waste. EOI #11 (Proctor & Gamble) is testing the composting of disposable diapers.

Composting using only the windrow method was the preferred approach given by 14 EOIs. Seven EOIs suggested in-vessel composting. EOI #7 and #27 proposed the use of in-vessel and windrow. EOI #32 and #74 use the Eweson in-vessel, static aerated pile method. Six EOIs did not state a preferred method (#34, #44, #53, #65, #70 and #76). Vermicomposting was proposed in EOI #38 and #48.

EOI #76 did not provide any information regarding its composting process or feedstock.

The EOIs indicated that a typical composting operation reduces the mass of the waste fraction up to 50 percent. Depending on the quality and type of feedstock, up to 15% of the material is non-compostable residue which requires landfilling. The reduction in mass occurs by conversion to carbon dioxide and/or methane and water depending on the composting method used. After composting, the total marketable product accounts for approximately 50% of the original organic mass.



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Currently in Ontario, no large scale markets for compost exist. Several EOIs with international experience state available markets elsewhere, while many EOIs offer to help in the establishment of local markets.

### 5.5.3 Composting Facilities Which Process Waste from a MRF

Since these facilities obtain their feedstock from the MRF sorting process, they will be grouped where possible by the MRF technology they are associated with.

Brini - EOI #3 (Advanced Ecol.) references the Brini windrow composting method to process 32% of the waste entering the MRF. EOI #51 (WMI) also proposes Brini but composts only yard waste.

A 400 TPD composting plant in Nanaimo, B.C. is scheduled to begin operation in 1990. Numerous smaller facilities are located in Europe, including the Kovic facility in Sweden (1982) handling approximately 200 TPD. At this plant, screened small size particles are mixed with sewage sludge and composted over a 10 week period. Compost material is used as landfill cover.

Buhler-Miag - Three EOIs #6, #29 and #31 reference the Buhler windrow composting method to process from 34% to 43% of the total waste input to the MRF.

Referenced Buhler-Miag plants include a 200 TPD facility in Sweden (1981) and a 100 TPD facility in Switzerland (1989). Each plant converts approximately 25% of incoming municipal waste to coarse and fine compost. The Swiss facility has recently been renovating their compost plant to process waste from a source separated collection system, since the product produced from mixed MSW was suitable only as a landfill cover. The static/dynamic composting process using reversible aeration and outdoor windrowing converts MSW and sewage sludge to compost in a 12 week period.

Lundell - Three EOIs #1 (Lamarche), #34 (Notre) and #58 (Weldex) propose the Lundell windrow or anaerobic in-vessel composting methods to divert 14 to 30% of the waste entering the MRF.



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The Thief River Falls, Minnesota plant (1985) diverts 25% by composting. Currently the compost product is given to local farmers. Lundell claims significant advantages with anaerobic composting particularly in terms of the marketability of the final product.

Pro-cyss - EOI #63 (Royaledge) proposes to send 36% of the waste entering their facility to an aerobic windrow type composting facility. Both existing and proposed plants referenced in Section 5.4 will use the compost product as a final landfill cover only.

Recomp - EOI #32 (Recomp) references the Eweson Digester which is marketed by EOI #74 (Bedminster Bio). The composting process begins with an aerobic in-vessel digester which is used to begin the fermentation process and allows mixing of other wastes such as sewage sludge. This stage is followed by a static pile system.

Several plants are operational in the U.S. including a 50 TPD composting facility in Gladewater, Texas, a 30 TPD facility in Big Sandy, Texas and the Recomp facility in St. Cloud, Minnesota.

EOI #11 (Proctor & Gamble) operates a disposable diaper recycling operation in association with the Recomp facility in St. Cloud.

According to Recomp, approximately 45 to 55% of the delivered waste (i.e., about 23 to 28 TPD) is sent through their Eweson composting digester. After solid waste has been digested and placed in windrows for composting, it goes through a series of screening processes. Compost markets include local nurseries, landscapers, and Christmas tree farms. All compost produced is currently marketed and sold.

SEII - EOI #25 (Kilborn) proposes to recover 50% of the total waste input into the MRF by composting to produce a humus product. The process combines an in-vessel stage of 14 days followed by a two month static pile stage. Existing and proposed plants are covered in Section 5.4.

Sorain - EOI #67 (Laidlaw) lists two separate composting processes to be used in their facilities from separate process streams generated by the MRF to process 32% of the waste:

i A self-contained Sorain process which uses aerobic reactions to reduce organic material.

ii A self-contained DRy ANaerobic COmposting (or DRANCO) system which produces a gas fuel and residue.



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The Sorain process is a mechanized aerobic windrow method which has been employed in many of the plants referenced in Section 5.4.

The DRANCO system is an in-vessel anaerobic system which produces a humus product and biogas. This process is relatively unproven as no existing plants were referenced.

SPM Resource Recovery - One EOI #7 (Cogenesis) will employ the in-vessel composting technology of SPM Group combined with a MRF by Resource Recovery Systems. The plant will recover 22% of the processed waste. Two SPM plants are referenced,one at 30 TPD in Preston, Minnesota and a second to be developed in Council Bluffs, Iowa at 230 TPD capacity. Both of these plants are based on the windrow method rather than in-vessel. The final product is applied to agricultural soils.

As an alternate, Cogenesis proposes technology by International Process Systems which has a 50 TPD automated, in-vessel aerobic composting plant in Fairfield, Connecticut. Production by this plant began in 1989 and performance information is not yet available. This process is also chosen by #69 (MSW Recycling).

Several other EOIs #53 (ONTC), #44 (Trican), #65(a) (Otto-Can), #71 (Env. Air) and #76 (Muscillo) indicate that composting will be employed in association with a MRF, however, no details are given regarding the process or existing facilities.

EOI #18 (WPF/BLI) is identified in Section 5.4 as a Group 3 MRF which performs some materials recovery of metals and aluminum prior to an aerobic windrow composting process. While the respondent references 5 similar facilities and claims to have consulted on four of them, no direct reference to an existing plant is made. A contract has been recently entered to provide Houston, Texas with a 500 TPD plant in 1990.

EOI #22 (Nera Bio) receives waste from a Lundell MRF as identified in Section 5.4. An in-vessel anaerobic process is employed on 45% of the waste entering the MRF to produce biogas and compost. An operating plant is referenced in Bronic, Italy since 1983 at 25 TPD, which was later increased to 200 TPD in 1987.

EOI #38 (Redipac) and #48 (Equity) discuss the use of vermicomposting as a method of diversion. Redipac references their existing facility in Scotland, Ontario but provides few details.



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Equity indicates that Ontario Recycling will provide composting expertise however again, no details are provided.

### 5.5.4 Composting Facilities Which Process Non-MRF Waste

The following facilities indicated that source separated wastes would be the preferred feedstock to their composting plants.

EOI #9 (Foster Wheeler) will process up to 1020 TPD of largely source separated yard waste using a Scarab windrow method. No existing plants are referenced or described.

EOI #11 (Proctor & Gamble) proposes to employ a Eweson Digester to process disposable diapers. This process is under Recomp in the previous section. A demonstration project has been operating since November 1989 in St. Cloud, Minnesota to test the ability to recover plastic and compost the paper from disposable diapers in mixed residential waste. Beginning in May, 1990, a second demonstration facility will go into operation in Seattle, Washington. This operation will collect source separated diapers from 1000 households and process them. The results of both programs would be applied to the GTA.

EOI #27 (Airtite) has proposed to compost up to 20% of the GTA waste stream by receiving yard waste and wet household waste. An in-vessel aerobic process will be used for the wet waste and the windrow method for yard waste. Airtite was involved in a 1 TPD in-vessel pilot program in Powell River, B.C. which operated successfully for 1 year in 1989.

EOI #30 (Compost Management) proposes to compost 7% of the GTA wastestream, consisting of yard waste, by windrow method. Compost Management Associates is affiliated with Organic Recycling Inc. of New York State. Together, they reference 18 (7 in Ontario) leaf composting facilities including small scale operations in Waterloo, Durham, Oakville and Markham.

Two American facilities, the City of New Rochelle, N.Y. and the City of Stanford, Connecticut handle approximately 20 TPD and 40 TPD, respectively. Composting is carried out in windrows and compost is used in landfill cover material, municipal projects or given away free of charge to local residents and businesses. These projects were working well according to the references contacted.



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EOI #59 (Agripost) proposes to process up to 60% of the GTA mixed residential and source separated yard waste.

The main project referenced is a 800 TPD (6 days per week) compost facility in Dade County, Florida. The facility is scheduled to begin commercial operations in May, 1990. Agripost does not cite any other relevant materials processing experience. Shakedown operations are currently underway and according to a Dade Country spokesperson, they have processed large quantities of waste. Agripost claims to have processed up to 500 tons per day during the shakedown period. Staffing levels are presently at 35 persons and will increase to 45 to achieve a full 800 TPD process throughput. Windrows and equipment are monitored 24 hours per day.

Residential, light industrial, and non-hazardous institutional mixed MSW are processed. The MSW is manually picked to remove recyclable aluminum, glass and plastics. Magnetic separation units are placed at several locations along the moving conveyors to remove ferrous material. The remaining compost feedstock, including inorganic fractions, is shredded and aerobically composted using the windrow approach. The processed compost is again shredded and screened, and then prepared for distribution under the trade name "AGRISOIL".

The Dade County agreement stipulates that Agripost is responsible for marketing their compost, and that they must pay all tipping fees to dispose of non-processable and hazardous waste in the County landfill. Agripost is actively attempting to market their compost, and has developed a pilot program in which local farmers use AGRISOIL in their fields. They also commissioned a Fairfax, Virginia firm to analyze the heavy metal concentrations in AGRISOIL. Results from the study indicate that all heavy metal concentrations are below federal, and State of Florida, New York and Minnesota maximum concentration limits. As of this date, however, they have not secured any long-term compost product contracts, at any revenue level.

EOI #65 (Otto-Canada) proposes to process up to 30% of the GTA wastestream by accepting wet household wastes, wood chips and yard waste. Otto referenced two operating composting plants in Germany. One plant, located in Hechingen, was established in 1987 and processes 200 TPD. A second 200 TPD facility is located in Knittlingen and has been in operation since 1988. No further details were provided.



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EOI #74 (Bedminster) proposes to process source separated and mixed residential waste at a demonstration scale. This process is described under Recomp in the previous section.

EOI #77 (Montenay) will compost 9% of the GTA's wet residential and commercial waste in association with wood fibre waste through in-vessel aerobic digestion. No specific technologies are proposed.

The remaining EOIs #15 (Expocrete), #21 (Round-up) #65(a) (Otto-Canada) and #70 (Faruk Fattah) did not provide details on the proposed or existing composting facilities. In most cases, several processes were being evaluated before a final selection was made.

5.5.5 Screening of Components - Composting Facilities (See Section 2)

Step C.1: "Mandatory Criterion"

Each response was evaluated for its ability to meet the mandatory criterion under this category:

- proven success of operation at scale suitable for the GTA.

Composting is not a new technology, but it is relatively new when using mixed municipal solid wastes as a feed stock. A major concern is the quality of the product and its potential end uses. Landfill cover is frequently suggested, but this has limited applicability, and quality must still be addressed.

Guidelines for the compost products must be introduced and those proposing compost as a part of their systems must be able to address these guidelines. Many EOIs did not include details and did not include descriptions or breakdowns of contaminants within the compost. The "windrow", static pile and in-vessel technologies are proven at a smaller scale than that proposed for the GTA. Based on the EOIs provided and further verification, the largest composting operation in North America is the Agripost 880 TPD facility in Dade County (Miami) Florida. This plant has been in service for less than one year. Many of the EOIs submitted also reflected limited composting experience.

Further investigation of the respondents' claims is needed.



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Step C.2: "Three Important Factors"

Specific siting information has not been supplied, therefore, the important factors are considered on a generic basis for composting facilities.

- demonstrated ability to meet environmental requirements

Most EOIs have addressed how they would control leachate run off, which is of concern with a composting operation. Similarly, indoor windrow facilities limit odour potential.

- flexibility of the component to incorporate future developments

The windrow system has less capital investment than in-vessel but requires more land. It may be more flexible with respect to future developments/expansions, provided space is available. "In-vessel" systems offer flexibility through modular design.

- Operations by 1996

All composting systems proposed can be operational by the year 1996, most can be sited and constructed within two years from the date of approvals. Siting is the key factor.

Step C.3: "Common Criteria and Specific Criteria"

Insufficient information was available to compare EOIs. The comments below highlight the important features of composting specific to each criterion.

A. Human Health and Safety

As previously noted, the control of runoff or leachate from composting operations, as well as, odours are critical. The design should address these areas.

B. Natural Environment

Sites would have to be chosen, especially for windrow systems, to mitigate effects on the environment.



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C. Social/Cultural

Site selection is the key to addressing the criteria in this category. Because of the land areas required, locations remote from built up areas would have to be considered for larger facilities.

D. Technical

More demonstration is required with in-vessel systems to confirm their potential advantages. The windrow system particularly would be flexible to replacement and incorporation of improved technologies.

E. Planning Framework

The windrow system could be maintained indefinitely, but more experience is required to estimate the life of in-vessel systems and vermicomposting. Approvals could be obtained for facilities with residues less than 200 TPD and could be constructed within 12 months following approvals. Site selection will be a key factor.

Significant diversion rates can be achieved but this is relative to the quality of end product and its marketability.

Summary

As noted in the previous section, many EOIs have included composting to divert portions of the waste stream. Table 5.5.2 shows that composting facilities which process waste from a MRF can divert a significant percent (from 15 to 50 percent) of the total waste input into the recovery facility.

EOIs which process strictly source separated waste or mixed waste not passing through a MRF, as shown in Table 5.5.3, claim the ability to handle up to 60% of the total GTA waste stream.

Existing facilities are generally in the development stage at much lower capacities and with limited information on the quality of the end product. The ability to divert such a large portion of the waste stream from landfill to a usable product has to be demonstrated in the GTA.



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This component has significant potential towards meeting the 50% diversion target by year 2000. Facilities can be provided to comply with the environmental criteria, but demonstration facilities are required for a full evaluation of this component.

## 5.6 HOUSEHOLD HAZARDOUS WASTES

Hazardous wastes from industry are banned from the municipal solid waste system being considered by SWISC. The removal of household hazardous wastes is becoming more critical with increased sophistication of the waste management components. Various means of achieving this are being used throughout the GTA and one of the objectives of the 3Rs Action Plan is to identify the most effective measures which should be taken. It is critical that householders be provided with facilities that will enlist their full co-operation.



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**Table 5.5.2.**
**Composting Facilities Receiving**
**Waste From A MRF**

| EOI # | Respondent | Process | MRF Type | TPD | % from MRF | Type (1) | Plant Information |
|---|---|---|---|---|---|---|---|
| 1 | Lamarche McGuinty | windrow | 1(b) | 600 | 15 | o.f. | 1 @ 4000TPD<br>Lundell technology |
| 3 | Advanced Ecology | windrow | 1(b) | 3648 | 32 | o.f. | 7 @ 770TPD<br>PLM Brini technology |
| 6 | Buhler Miag | windrow (static/ dynamic fermentation) | 1(b) | 4733 | 38 | o.f.<br>y.w.<br>s.s. | 6-10 @ 200TPD<br>Buhler technology |
| 7 | Cogenesis Corp. | aerobic in-vessel and windrow | 1(c) | 4562 | 22 | o.f.<br>y.w.<br>s.s. | 78 @ 80TPD<br>SPM Resource Recovery or International Process Systems technology |
| 18 | WPF/BLI Waste Reduction | windrow | | 900 | 90 | o.f. | 1 @ 200-10000TPD |
| 22 | Nera Bioenergy | in-vessel anaerobic digestion | 1(b) | 337 | 45 | w.h.<br>s.s. | 1 x 750 TPD<br>Delta Biogas technology |
| 25 | Kilborn | in-vessel aerobic | 1(b) | 7000 | 50 | o.f.<br>y.w.<br>s.s.<br>w.h. | 14 x 720 TPD<br>SEII technology |
| 29 | Encomp | windrow | 1(b) | 3750 | 43 | o.f.<br>w.h.<br>y.w. | 6-8 x 400-2000<br>Buhler technology |
| 31 | Reuter | windrow | 1(b) | 2058 | 34 | o.f. | 6 x 100 TPD<br>Buhler technology |
| 32 | Recomp | in-vessel/ static pile | 1(b) | 2080 | 40 | o.f.<br>w.h.<br>y.w.<br>s.s. | 7 x 1000 TPD<br>Eweson technology |

(1) o.f. = organic fraction, s.s. = sewage sludge, y.w. = yard waste
w.h. = wet household, f.w. = commercial/industrial food waste

**Table 5.5.2.**
**Composting Facilities Receiving**
**Waste From A MRF**

| EOI # | Respondent | Process | MRF Type | TPD | % from MRF | Type (1) | Plant Information |
|---|---|---|---|---|---|---|---|
| 34 | Notre | windrow or anaerobic in-vessel | 1(b) | 530 | 14 | o.f. | 1-2 as required<br>Lundell technology |
| 38 | Redipac | vermicom-posting | 3 | 1100 | 5 | f.w. | 7500 sq. ft. bait worm facility in Scotland, Ontario<br>Redipac technology |
| 44 | Trican Energy | not stated | 1(c) | 2129 | 11 | o.f.<br>w.h. | 25 @ 800 TPD<br>National Recovery |
| 48 | Equity Waste Manag't | vermicom-posting | 1(b) | 730 | 6 | o.f.<br>y.w.<br>s.s. | 3 x 400 TPD<br>Ontario Recycling Inc. technology |
| 53<br>75 | ONTC | not stated | 1(b) | 2800 | 35 | o.f. | 1-2 x 4000 TPD<br>Cal Recovery design |
| 58 | Weldex | windrow | 1(b) | 600 | 30 | o.f. | 4 x 500 TPD<br>Lundell technology |
| 63 | Royaledge Pro-CYSS | windrow | 1(b) | 5500 | 36 | o.f.<br>y.w.<br>s.s. | 14 x 900-1200 TPD<br>Pro-CYSS technology |
| 67 | Laidlaw | in-vessel aerobic digestion | 1(b) | 4844 | 32 | o.f. | 5-7 x 4000 TPD<br>Sorain technology |
| | | in-vessel dry anaerobic digestion | | (?) | (?) | o.f.<br>w.h.<br>y.w.<br>s.s. | 2 x 2400 TPD<br>DRANCO technology |
| 69 | MSW | in-vessel aerobic | | 6400 | (?) | o.f.<br>y.w.<br>w.h. | 2 @ 3500 TPD<br>International Process Systems tech. |
| 71 | Env. Air Structure Tech. | windrow | 1(a) | 3000 | (?) | o.f.<br>y.w. | 4 @ 750 TPD |

(1) o.f. = organic fraction, s.s. = sewage sludge, y.w. = yard waste
w.h. = wet household, f.w. = commercial/industrial food waste

Table 5.5.3.
Composting Facilities Receiving
non-MRF Waste

| EOI # | Respondent | Process | TPD | % of GTA | Type (1) | Plant Information |
|---|---|---|---|---|---|---|
| 9 | Foster Wheeler | windrow | 1024 | 5.0 | y.w. | 3 @ 340TPD<br>Scarab windrow<br>Resource Recovery Systems |
| 11 | Proctor & Gamble | in-vessel | | | d.d. | plant size and number not stated<br>use Eweson digestor at St. Cloud, MN |
| 15 | Expocrete | windrow | 30 | 0.1 | y.w.<br>w.c.<br>w.h. | 1 @ 60TPD |
| 21 | Round-up | in-vessel aerobic | 8000 | 40.0 | w.h.<br>y.w.<br>w.c. | 10,000 TPY units to be grouped to meet needs |
| 27 | Airite | in-vessel aerobic windrow for yardwaste | 4243 | 21.0 | y.w.<br>w.h. | to be determined<br>Airite technology |
| 30 | Compost Mgt. | windrow | 1375 | 7.0 | y.w. | to meet GTA needs<br>Affiliated with Organic Recycling Inc. |
| 51 | WMI | windrow | 964 | 5.0 | y.w. | 1 @ 1200 TPD<br>Brini technology |
| 59 | Agripost | windrow | 12064 | 60.0 | m.r.<br>y.w. | 18 @ 600 TPD<br>Convertit technology |
| 65a | Otto-Canada | not stated | 6140 | 30.0 | w.h.<br>w.c.<br>y.w. | 17 @ 400 TPD |

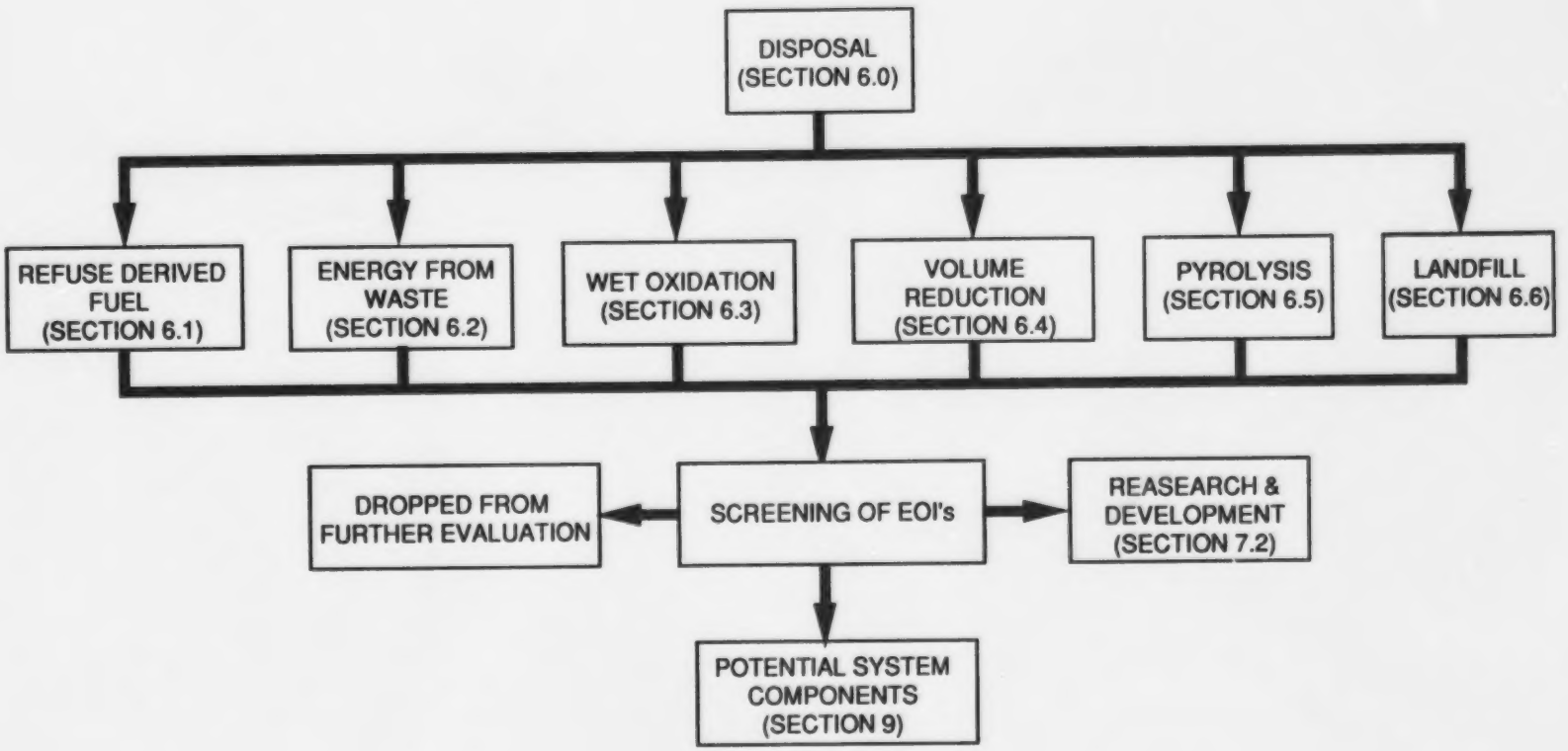
(1) s.s. = source separated, y.w. = yard waste, w.h. = wet household, w.c. = wood chips
d.d. = disposable diapers, p.r. = paper residue, m.r. = mixed residential

Table 5.5.3.
Composting Facilities Receiving
non-MRF Waste

| EOI # | Respondent | Process | TPD | % of GTA | Type (1) | Plant Information |
|---|---|---|---|---|---|---|
| 70 | Faruk Fattah | not stated | 6083 | 30.0 | m.r.<br>w.h.<br>y.w.<br>s.s. | 1 @ 6083 |
| 74 | Bedminster | in-vessel aerobic/ static pile | 200<br>100 | 1.0<br>0.5 | m.r.<br>s.s. | 1 demonstration plant @ 200 TPD<br>100 TPD sewage sludge<br>Eweson technology |
| 77 | Montenay Atlantic | in-vessel anaerobic digestion | 1750 | 9.0 | w.h.<br>p.r. | 1 @ 1750 TPD<br>- experience with MRFs |

(1) s.s. = source separated, y.w. = yard waste, w.h. = wet household, w.c. = wood chips
d.d. = disposable diapers, p.r. = paper residue, m.r. = mixed residential

**FIGURE 6.0: DISPOSAL**


DISPOSAL (SECTION 6.0)
REFUSE DERIVED FUEL (SECTION 6.1)
ENERGY FROM WASTE (SECTION 6.2)
WET OXIDATION (SECTION 6.3)
VOLUME REDUCTION (SECTION 6.4)
PYROLYSIS (SECTION 6.5)
LANDFILL (SECTION 6.6)
DROPPED FROM FURTHER EVALUATION
SCREENING OF EOI's
REASEARCH & DEVELOPMENT (SECTION 7.2)
POTENTIAL SYSTEM COMPONENTS (SECTION 9)

# 6.0 DISPOSAL

## 6.1 REFUSE-DERIVED FUEL (RDF)

This section of the report addresses those EOIs which proposed facilities for disposal of wastes after diversion. They are divided, as described in Section3, into the components RDF; EFW; Wet Oxidation; Volume Reduction; Pyrolysis and Landfill.

A description of the component is presented with its advantages and disadvantages as part of a waste management system. The EOIs received are then described as a basis for the evaluation procedure. In view of the lack of sufficient detail in the information to evaluate the EOIs fully on a comparative basis, the evaluation procedure is carried out on the component to determine its suitability. Within the initial steps of the evaluation, the EOIs are screened to identify the additional information which would be required to pursue those components for which RFPs for full scale operations could be issued and those which would be referred to R & D. It was decided by the Technical Committee that it was premature to propose a short list of respondents who would be asked to submit RFPs.

### Generic Description

RDF is a fuel prepared from municipal solid waste usually through some form of mechanized process (see Section 5.4). Using mechanical processes such as hammer mills, shredders, magnetic separators, air classifiers and various screening techniques, the waste is broken down into uniform sized particles and separated into combustible and noncombustible fractions.

The noncombustible fraction (metals, glass, inerts, etc.) are recovered for recycling markets.

The combustible fraction comprising cellulose (paper, wood) and organics (plastic, food and yard wastes) is generically referred to as RDF, a fuel suitable for combustion in dedicated incinerators or used as a supplementary fuel in industrial boilers, kilns, etc.

The raw RDF may be further refined by utilizing air cleaning and densification processes to produce a higher class of RDF. A general classification of RDF is provided in the following list for further clarification:



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| | |
|---|---|
| RDF-1 Raw | MSW as a fuel in an as-discarded form without oversize bulky waste |
| RDF-2 Coarse (cRDF) | MSW processed to coarse particle size with or without ferrous-metal separation, (95% by weight passes through a 6-in-square mesh screen) |
| RDF-3 Fluff (fRDF) | Shredded fuel derived from MSW processed for the removal of metal, glass, and other inorganics (95% by weight passes through a 2-in-square mesh screen) |
| RDF-4 Powder (pRDF) | Combustible waste fraction processed into powdered form |
| RDF-5 Densified (dRDF) | Combustible waste fraction densified (compressed) into pellets, slugs, cubettes, briquettes, or similar forms |
| RDF-6 Liquid | Combustible waste fraction processed into a liquid fuel |
| RDF-7 Gas | Combustible waste fraction processed into a gaseous fuel |

Source: The American Society of Testing and Materials (E-38.OI, E-776 to E-79-81); and ANL/CNSV-TM-120, Vol. 4.

A resource recovery facility may be expected to reduce waste quantities requiring disposal at a landfill in the order of 60 percent on a volume basis. Also the plant would not necessarily have to be located close to the user of the RDF as these materials can be transported and stored at the user site.

The advantages and disadvantages of the RDF processing and disposal technology are the following:

**Advantages:**

- may be less expensive than mass burning (see Section 6.2 on EFW) if dedicated boiler for the RDF not required.
- RDF is transportable and therefore not constrained in its variety of uses for the production of energy such as is the case with energy produced from an EFW plant.
- RDF can be burned in conjunction with other solid fuels in traditional boilers.



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- potential to reduce overall waste haulage costs if the plant can be located near major sources of waste generation.
- RDF classes 1 to 5 are proven technology at a commercial scale.
- processing of waste is handled internally therefore potential for dust and litter much reduced over landfill if the facility is properly designed and operated.
- processing of waste internally, therefore potential for nuisances from birds and other vermin much reduced over landfill if the facility is properly designed and operated.
- potential to reduce impact and displacement of agricultural landuses by reducing the requirement for land disposal of refuse.
- potential for moderate degree of support and acceptability by the public since RDF production viewed as a progressive means of handling wastes in comparison with straight incineration of raw waste in a mass burning unit or disposal of raw wastes in a landfill.
- site can be returned for redevelopment following decommissioning of the RDF facility.

**Disadvantages:**

- relatively high operating costs.
- unless the overall waste management system well thought out an RDF plant can compete with other 3Rs programs.
- system is relatively complex and some downtime can be expected. Hence backup and contingency planning in the overall waste management system is required.
- to make the system viable, long-term markets for the RDF and other recovered materials is required.
- some of the processing plant unit operations (shredders for example) have had poor operating history.
- RDF classes 6 and 7 have experienced limited success and therefore cannot be considered as proven technology.
- storage of RDF at user site can pose problems both technically and environmentally unless the receiving storage and material facilities are properly designed and operated.
- up to 33 percent of raw waste (by volume) may require landfill and therefore the system has the potential to impact on the quality of the ground and surface water unless the receiving site is properly design and operated.



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- plant can impact on traffic capacity unless located in an area where an adequate road system is available to handle increased volume.
- potential for odour impacts unless plant properly designed and operated.
- has potential to negatively impact on existing landuse and community character unless facility is sited and designed to minimize this impact.
- RDF classes 4 to 7 have the potential to decrease air quality due to emissions unless the RDF plant is designed, maintained, operated and monitored properly.
- potential to pass the environmental issues associated with refuse burning and ash disposal from the RDF site to the sites receiving the RDF as a supplementary fuel causing difficulties in securing RDF markets.

**EOIs Received**

The EOIs received for RDF are summarized on Table 6.1.

Fifteen respondents proposed some form of Refuse Derived Fuel technology generally as a product from a mechanized process or MRF systems. The majority of the respondents described the production of RDF for conventional EFW plants. The form of the product included pellets, shredded fluff and fuel bales. One of the respondents indicated that the RDF would be used as a feedstock for the production of cement.

Respondents #67 and #70 suggest that an RDF component could be supplied if wanted, but make no specific proposal or identify the proposed processes.

**Common Features and Differences**

Locations remote from the GTA are proposed by two companies. EOI #53 proposes a location in the Sudbury area with the transport of all the GTA wastes there for separation and treatment. The other proponent (EOI #73) proposes a scheme where baled wastes will be transported by ship to the Maritime Provinces for the production of RDF, however, no decision has been made about the location of the site. As is indicated in the assessment of this EOI as a system, no alternative transport system was proposed for the winter months when the Seaway is closed.



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EOI #4, a Pyrolysis respondent (see Section 6.5), has specifically indicated that the char produced could be made available for use as RDF. The marketability of this product would have to be proven on the scale required.

EOI #5 proposes the use of limited quantities of waste for the production of fuel for a cement kiln. The total amount of wastes acceptable for this proposal is 250,000 tonnes annually after Blue Box separation.

One company (EOI #24), with experience in the coal handling field has proposed that mechanically separated MSW material would be mixed with coal to form RDF. The proponent has no experience in handling MSW.

The remaining proposals involve mechanical and hand sorting of the wastes before the production of RDF. The methods proposed are generally similar in concept but differ in the order and extent of the treatments. In one case (EOI #25) dechlorination of the wastes is proposed prior to the final RDF formation.

**Component Evaluation** (see Section 2)

Step C.1 and C.2: Mandatory and Three Important Factors

RDF production in material classification of raw, coarse (cRDF), fluff (fRDF) and densified (dRDF) can be considered as proven technology at a scale suitable for GTA with the flexibility to incorporate future development in waste management. Processes involving further refinement of RDF have experienced limited success in achieving production capacity, environmental approvals or market acceptance and are not recommended for consideration in the GTA at this time.

Screening of the EOIs under C.1 and C.2 was therefore performed on the basis of the information supplied with regard to the RDF product to be prepared, experience of the respondents with MSW and RDF production, record of the proposed equipment to meet production rates suitable for GTA and achieve environmental approvals with the target operational date of 1996. On the basis of the information received, these factors are best met by the following respondents:



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| | |
|---|---|
| St. Lawrence Cement Inc. | EOI #5 |
| Buhler-Miag | EOI #6 |
| Kilborn Ltd. | EOI #25 |
| Waste Management of Canada Inc. | EOI #51 |
| Ontario Northland Transport Commission | EOI #53 |
| Weldex Company Ltd. | EOI #58 |

It is recommended that EOI #4 (Dynavest) and EOI #24 (Environmental Disposal Systems) be considered further under the R & D program.

Step C.3: Common and Specific Criteria

With the acceptance of certain classes of RDF technology as satisfying criteria C.1 and C.2, the evaluation of the common criteria C.3 has been addressed on a generic basis.
The comments below highlight the important features specific to each major criterion. The detailed analysis of the common criteria for RDF facilities described under Section 2 has been carried out under the Regions' Master Plans.

(a)Human Health and Safety

Depending on the level of refinement of the product, RDF facility has the potential to impact on air quality if not properly designed, operated or monitored during operation. There is potential for degradation of the surface or groundwater quality in the vicinity of residue disposal sites however these impacts would be similar to those outlined under landfill (see Section 6.6).

(b)Natural Environment

RDF facilities are normally sited in urban areas and therefore their major potential impact on the natural environment is essentially tied to the disposal of process residues.

(c)Social/Cultural

The major issues surrounding impact on the social/cultural environment are associated with facility location and visual impact. Careful consideration in siting and design of the RDF facility will mitigate to a large extent the impacts associated with this criterion.



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(d)Technical(e)/Planning Framework

The technical and planning issues surrounding RDF facilities have been addressed in the Regions' Master Plans. None of the issues cited in these criteria would eliminate an RDF facility of proven technology as a component in a waste management system.

Summary

Disposal by RDF is a viable component and should be considered further by SWISC in development of a long-term waste management system for GTA.



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Table 6.1.1
Summary of RDF EOIs Received

| EOI No. | Respondent | Type | Product Use at RDF Processing Site or Remote | . Proposed Location . Number and Size of Facilities Proposed | Comment |
|---|---|---|---|---|---|
| 4 | Dynavest International Ltd. | Mechanized with some hand-picking. RDF is produced as fluff | Pneumatically conveyed to EFW unit. | . Not identified<br>. 2 @ 240 TPD units - 480 TPD proposed for 1990<br>44 @ 240 units - 10,560 TPD proposed for 2000 | Char produced (see Pyrolysis). All products marketable. No landfill identified, but claims to reduce landfill. Only 2TPH demonstrated. at Rock Island, Illinois |
| 5 | St Lawrence Cement Inc. | Produces fluff (fRDF) which can be modified for other uses. Incineration of RDF in cement kiln. 40% waste go to landfill. | At Processing Site | . Mississauga. cement plant<br>. 250,000 TPY accepted after Blue Box produces 140,000 TPY RDF | Cement plant operating conditions are suitable for incineration of wastes. |
| 6 | Buhler-Miag | Mechanized with some hand picking. Pellets and/or fluff can be produced. 66% wastes Recovered 34% to RDF or landfill | At Processing Site | . Not specific; to suit GTA needs<br>. 11,350 TPD (24 @ 500 TPD units proposed | See also composting and research. 120 plants around the world. |

Table 6.1.1
Summary of RDF EOIs Received

| EOI No. | Respondent | Type | Product Use at RDF Processing Site or Remote | . Proposed Location . Number and Size of Facilities Proposed | Comment |
|---|---|---|---|---|---|
| 7 | Cogenesis Corp. | Mechanized with some hand picking. Propose European technology but not specified which technology. Produces fluff which can be pelletized. | At Processing Site | . No specific site indicated. . 28 @ 250 TPD units . 6,084 TPD of RDF | Cogenesis has no experience with MSW. specific technology for RDF discussed in the EOI. |
| 24 | Environmental Disposal Systems Inc. | Mechanical separation, product mixed with coal. Product may be as fluff or pellets. | Remote | . Anywhere in GTA . No details of plant capacities are given | Company has good experience in coal processing, little in handling MSW. |
| 25 | Kilborn Ltd./ SEII (France) | Crushing and separating with dechlorination and pelletizing for production of RDF. On-site composting also proposed along with on-site power production if RDF market not available. | Depends on RDF Market | . At existing landfills. . 4,460 TPD plant is proposed | One plant (360 TPD built 1979) operating One 360 TPD plant under construction by SEII for (1991). Kilborn is experienced in general engineering. |

Table 6.1.1
Summary of RDF EOIs Received

| EOI No. | Respondent | Type | Product Use at RDF Processing Site or Remote | . Proposed Location<br>. Number and Size of Facilities Proposed | Comment |
|---|---|---|---|---|---|
| 31 | Reuter of Canada Inc. | Equipment not specified. Produce pellets or fluff (dRDF or fRDF). | Remote | . Sarnia, Kettle Point or GTA.<br>. 1,000 TPD facilities producing 300 TPD RDF. 6 units by 1995. Others as needed. | Operating 400 TPD MRF in Eden Prairie, Min. No RDF experience shown. |
| 51 | Waste Management of Canada Inc. | WMI system, Wheelabrator to supply EFW plant. Produces pelleted or cubed RDF. | At Processing Site | . At existing facilities.<br>. Two units @ 3,300 TPD production each. | Extensive experience, full system proposed including construction and demolition wastes. |
| 53 | Ontario Northland Transport Commission. | With Cal Recovery Systems. Mechanical separation to produce baled fluff and/or pellets. | Remote | . In North Ontario Sudbury vicinity<br>. No specific site indicated.<br>. System accepts 8,000 TPD actual wastes producing 600 TPD of RDF from 4,000 TPD allocated if incineration component is accepted. | Forms part of complete system with Ont. Northland handling transportation. Others supply technologies. Overall experience good. |

Table 6.1.1
Summary of RDF EOIs Received

| EOI No. | Respondent | Type | Product Use at RDF Processing Site or Remote | . Proposed Location . Number and Size of Facilities Proposed | Comment |
|---|---|---|---|---|---|
| 58 | Weldex Company Ltd. | Catrel (Swiss technology) Separation, neutralization, extrusion to produce dRDF. Offering CSI thermal screw press which mixes sewage sludge, wood and paper for extrusion and drying to produce dRDF as well. The press can also be used on shredded tires. | Remote | . No specific site indicated. . 500 TPD Residential waste accepted producing 135 TPD RDF. | Weldex is to be joint venture organizer. Weldex is equipment manufacturer entering MSW field. Cartel has 200 TPD plant operating in Moudon, Switzerland with second under construction. |
| 63 | Royaledge Industries Inc./ Pro-CYSS | PRO-CYSS mechanized process. Light fraction can be used for recycling for paper manufacture of fRDF | Remote | . Within GTA but not specified. . up to 5,464 TPD is said to be available for use as RDF or paper recycling | Royaledge has no previous MSW operating experience. Pro-CYSS recently formed (August, 1989) has no operating experience in RDF. |

**Table 6.1.1**
**Summary of RDF EOIs Received**

| EOI No. | Respondent | Type | Product Use at RDF Processing Site or Remote | . Proposed Location . Number and Size of Facilities Proposed | Comment |
|---|---|---|---|---|---|
| 67 | Laidlaw Waste Systems, Inc. | RDF is suggested as possible option should it become a viable market. No details are given. | Not Specified | . No specific site indicated. | No specifics are given for any part of the RDF Component. |
| 70 | Faruk Fattah | System is proposed for producing sterile baled waste for storage or landfill etc. RDF is offered as a possible use. No details. | Not Specified | . No specific site indicated. . 3,610 TPD suggested as available for EFW purposes. | No specific proposal is made with respect to RDF. |
| 71 | Environmental Air Structure Technologies (EAST) | Hand picking, shredding, drying and compression, into (3'x 3'x 6') bales. | Remote | . Not specified. | No detail given on technology. No experience with MSW indicated. |
| 73 | Surety Environmental Inc. | Material pelletized and baled for delivery to EFW plant in Maritimes. | Remote | . In Maritimes | No detail given on technology. Surety have no experience in the MSW field. |

## 6.2 ENERGY FROM WASTE (EFW)

### Generic Description

EFW refers to the high temperature burning of solid wastes (generally resulting in an 80 to 90 percent volume reduction of the original waste quantities) and the recovery of energy produced from the combustion process. Energy released from the process may be used to provide steam either for direct sale or to produce electricity. For economic feasibility, a plant producing steam should be located within reasonable proximity to the steam purchaser, however, a plant producing electricity requires only to be located within reasonable distance of a suitable power distribution grid.

With respect to waste combustion, two general categories of incinerator/boiler systems have been widely utilized in north America: modular and moving-grate waterwall. Generally, the former is most economical in the up to 400 TPD plant size with the latter being more appropriate in larger plant sizes.

The modular incinerator design features two-stage combustion, the primary stage burning the refuse at relatively low temperatures under controlled air supply, the secondary stage completing combustion, also under closely controlled air additions. In general, the primary and secondary chambers are refractory lined. Flue gases leave the secondary chamber and enter a waste heat boiler. The heat recovery efficiency for modular type systems is typically in the order of 60 percent.

The main features of modular incinerators are lower capital construction costs, shorter construction lead times, lower operating costs due to mass burning of the refuse (i.e. no preparation of the waste prior to burning), and low particulate emissions with high combustion efficiencies.

The moving-grate waterwall designs were originally developed over 30 years ago in Europe and are now widely used around the world. Unit sizes range up to 1,100 TPD and feature a moving bottom grate with lined waterwall combustion chamber with heat recovery from both the combustion chamber walls and in-line boilers. The main features of the moving-grate waterwall incinerators are also mass burning of as-received refuse but with slightly higher thermal efficiencies, in the order of 65 percent.



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While variations on these technologies are available, they have not enjoyed widespread application. Moving-grate refractory wall units (as opposed to waterwall units), generally have lower capital costs than the waterwall systems but useable heat is not removed in the combustion chamber. Several manufacturers also utilized a rotary kiln configuration. Modern EFW plants may also incorporate front-end material removal and recovery facilities.

None of the EOIs proposed fluidized bed technology, presumably because of the limited experience with such plants for MSW.

Particulate emissions from waste incineration, except in some smaller facilities, require air pollution abatement measures such as high efficiency electrostatic precipitators or bag house/acid gas removal systems. Recent studies have demonstrated the effectiveness of these pollution abatement technologies in meeting current air emissions standards.

Bottom ash (which includes the non-incinerables) and fly ash (the particulates removed in the emissions cleanup equipment) still require disposal, regardless of the type of incinerator employed. Presently, Ministry of the Environment regulations permit incinerator residues (ashes) to be disposed of at approved municipal landfill sites. As an alternative, ash disposal may be carried out at a monofill (a special landfill or a portion of an existing municipal site dedicated to ash-only disposal). There is concern within the regulatory community that fly ash could be classified as hazardous waste and in future incinerator residues may require testing according to O. Regulation 309 to ensure the appropriateness of municipal landfill sites for their disposal.

EFW plants using both the modular and moving-grate configurations, are in widespread use around the world and represent a proven technology.

Experience at numerous facilities has demonstrated that incineration systems will operate well if properly designed and maintained. The advantages and disadvantages associated with the EFW disposal technology are the following:

**Advantages:**

- reduces volume of wastes requiring landfill by 80 to 90 percent;



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- good use of available energy in waste;
- potential to recover metals from the residue for recycling;
- will meet current regulatory standards if properly designed, maintained and operated;
- reduces haul costs if located near major sources of waste generation;
- economically comparable to other disposal options providing a suitable market for the generated energy can be found;
- unloading and handling of waste undertaken within an enclosed structure therefore nuisance of litter, dust, birds and other vermin largely avoided;
- displacement and disruption of large areas of agricultural lands for straight landfill reduced;
- provides fixed long-term location for waste disposal and therefore stability for long-term waste management planning;
- site suitable for future redevelopment following facility decommissioning.

**Disadvantages:**

- high capital and operating costs (potentially offset by energy revenue);
- some planned maintenance downtime to be expected;
- complex operation and maintenance skills required;
- potential air pollution and decreased - local air quality if not properly designed, operated and monitored;
- economic viability can be adversely affected by fuel prices or economic recessions
- potential for surface and groundwater pollution at ash disposal sites if sites are not properly designed, operated and monitored;
- potential for increased traffic congestion and reduction of access route capacity unless road systems are improved or site located where adequate capacity available;
- potential for odours unless adequate odour control provisions are incorporated in the design of the building
- potential for noise problems unless proper thought given to siting and design of the facility;
- potential difficulty from low public acceptability of the technology mainly due to concerns over air emissions;
- fly ash may require special treatment/disposal as a hazardous waste;



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- ash disposal requirements have potential to impact on agricultural land reserves
- potential for negative visual impact from stack. Also from facility size and shape if site selection and architectural treatment not carefully considered;
- potential for reduction in adjacent property values therefore fair compensation and mitigation policies are necessary;
- as a disposal option, EFW (incineration) less flexible than landfill since some types of waste and significant fluctuations in waste loadings cannot be accommodated.

**EOIs Received**

The EFW submissions are summarized in Table 6.2.

A total of 17 respondents have included Energy from Waste components in their proposals. Two of the EOI received (# 43 and 53) are related and propose an EFW plant located in Northern Ontario. The facility, a mass burn EFW, is outlined in EOI # 53 and described in detail in EOI # 43.

Four of the submissions lack detail; EOI #20 mentions the production of excess heat for steam generations, EOI # 35 is a general proposal for the receipt and handling of waste by the respondent but gives no specifics of the processes involved, EOI # 36 consists only of a letter of intent and EOI #65A gives no specific details.

One EOI (#73) proposes that separated wastes be shipped by vessel for incineration in the Maritime Provinces but does not give details of the EFW plant.

**Common Features and Differences.**

Insufficient information about the operational methods etc. is given in the EOI to permit differentiation between proposals where technologies are similar. The following remarks are thus concerned only with major differences between the proposals where sufficient information on the proposed burning processes are provided.

Two of the proposals (EOI # 20 and 66) are directed primarily at the formation of lightweight,



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ceramic aggregate for use as a construction material. Clay is added to the waste before it is incinerated. The clay fuses under the incineration conditions and envelops the residual ashes with a ceramic like coating. If a suitable market cannot be found the clay increases the weight and volume of the residues to be landfilled. Both use rotary kiln technology. The experience of the proponents is limited while the marketability of the product and the capability of the equipment to perform as described are not proven at a commercial scale for either of these proposals.

Rotary kiln technology, used solely for incineration purposes, is proposed in EOI #2 and #58. This technology which requires the use of an afterburner to ensure complete combustion of the waste exhaust gases, possesses the capability of handling wastes of all types. The technology has been used for destroying hazardous wastes.

The remaining proposals are for moving grate incinerators supplied by various manufacturers. All of the grates proposed have been in extensive use for MSW and EFW plants. They differ mainly in the method of moving the wastes from the feed end to the ash discharge end of the grates.

All of the incinerators will require the addition of pollution control equipment to comply with environmental regulations. Where a specific method of control is proposed the use of a dry scrubber and baghouse system has been indicated.

**Component Evaluation** (see Section 2)

Step C.1 - Mandatory

EFW is a proven technology with proven success of operation at a scale suitable for GTA.

Step C.2 - Three Important Factors

Since EFW is a proven technology with flexibility to incorporate future developments in waste management, screening of the information provided in the EOIs under C.2 was performed on the experience of the respondents, performance history of the equipment to meet both environmental requirements and the target operational date of 1996. These factors are best met by the



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following EFW respondents:

| | |
|---|---|
| Westinghouse | EOI #2 |
| Foster Wheeler | EOI #9 |
| Crang and Boake | EOI #40 |
| Ontario Northland/ Stinnes | EOI #43 and 53 |
| Waste Management Inc./ Wheelabrator | EOI #51 |
| Weldex Company Ltd. | EOI #58 |
| ICG | EOI #68 |
| Muscillo Transport/ Fonsar | EOI #76 |
| Montenay Inc./ Atlantic Packaging | EOI #77 |
| Ogden-Martin | EOI #78 |

It is recommended that EOI #20 (See-Bah) and EOI #66 (Pattison) be further assessed through the R & D program. The R & D program should also include studies on ash disposal.

It should also be noted that EOI #78 claims proprietary rights over the technology proposed by EOI #77. This matter requires further clarification.

Step C.3 - Common and Specific Criteria

With EFW technology satisfying both criteria C.1 and C.2, the evaluation of criteria C.3 has been addressed on a generic basis.

The comments below highlight the important features specific to each major criterion. The detailed analysis of the common criteria for EFW facilities has been carried out for the Regions' Master Plans.



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(a)Human Health and Safety

EFW has the potential to impact on air quality if not properly designed, operated or monitored during operation. The potential for degradation of the surface or groundwater quality in the vicinity of ash disposal sites also exists unless these facilities are properly sited and designed to minimize the impact.

(b)Natural Environment

EFW facilities are normally sited in urban areas and therefore their major potential impact on the natural environment is essentially tied to the disposal of residues. As noted these impacts can be mitigated to a large extent by the proper siting, design and operation of the ash disposal facilities.

(c)Social/Cultural

The major issues surrounding impact on the social/cultural environment are associated with facility location and visual impact. Careful consideration on siting the EFW plant and its architectural treatment are key to minimizing the impacts under this criterion.

(d)Technical/(e) Planning Framework

The technical and planning issues surrounding EFW facilities have been extensively addressed in the Regions' Master Plans. None of the issues cited in these criteria would preclude selection of an EFW facility as a component in a waste management system.

Summary

EFW represents a proven disposal technology and should be considered further by SWISC as a component in the long-term waste management system. An estimated composition and heat content of the waste remaining after the 50% diversion of waste should be provided as a consistent basis for RFPs.

Further, studies on disposal of ash are recommended as part of the R & D program. Modular



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Table 6.2.1
Summmary of EFW Submissions

| EOI No. | Respondent | Type | Location and Size | Comments |
|---|---|---|---|---|
| 2. | Westinghouse | Westinghouse Rotary Kiln | . Throughout GTA no specific location<br>. 7 units of 1,500 TPD capacity | Extensive experience in this field. Fully documented proposal. |
| 9 | Foster Wheeler | Foster Wheeler Mass Burn | . Not Identified | Extensive experience in this field. Installations in Montreal and U.S.A. |
| 20 | See-Bah Waste Elimination Technologies Inc. | Unidentified Rotary Kiln | . Algoma Steel Plant<br>. 500 TPD units, total size to be negotiated. | Mixes clay with MSW feed to produce ash forming ceramic pellets. No market evaluation submitted. |
| 35 | Enviromax Corp. | Unidentified | . Town of Haldimand<br>. 4,000 TPD | Land owned by Co. Generalized proposal. Suppliers noted but no firm selections made. |
| 36 | 808106 Ontario | Unidentified | . Not identified. Near landfill or transfer station.<br>. 16,000 TPD source separated 11,500 TPD RDF feed | Only combustion temp. and residence time quoted. No experience quoted. |
| 40 | Crang and Boal | Von Roll Mass Burn | . Not identified<br>. 2 plants each 3 @ 750 TPD units | Von Roll has long-term experience in the EFW field. |
| 43 | Stinnes | Steinmuller Mass Burn | . Kapuskasing, town has shown support<br>. 2,200 TPD | See EOI 53 for integrated system with Ontario Northland R.R. Can be increased in size by 550 TPD increments. |
| 51 | Waste Management with Wheelabrator | Von Roll Mass Burn | . Not identified<br>. 7,634 TPD | Mass burn - with Foster Wheeler boilers. Wheelabrator have significant experience in EFW. |
| 53 | Ontario Northland Transit Comm. | Steinmuller Mass Burn | . Sudbury vicinity<br>. See Stinnes, EOI #43 | See Stinnes, EOI #43. |

**Table 6.2.1**
**Summmary of EFW Submissions**

| EOI No. | Respondent | Type | Location | Comments |
|---|---|---|---|---|
| 58 | Weldex Company Ltd. | UEI Rotary Kiln | . Not identified<br>. 2,000 TPD, 4 units at 500 TPD | Steam boiler could be fitted. Five commercial units up to 250 TPD constructed. |
| 65A | Otto Canada Inc. | No details given | . No information re EFW | |
| 66 | Pattison Information Inc. | Neutralysis Indus Inc. Rotary Kiln | . Not specified<br>. 550 TPD units to meet demand (at up to 20 locations) | Mixes clay with MSW to produce ash in ceramic aggregate form. |
| 68 | ICG | Takoma (Japan) Mass Burn | . Not identified<br>. 200 TPD to 2,000 TPD units, supplied to meet demand | Takoma units well proven. |
| 73 | Surety Env. Inc. | Unidentified | . Maritimes<br>. No sizes quoted | No detail given on technology. Waste transferred to Maritimes for separation and destruction. Transfer station is located at Port of Toronto area. Surety has no experience in the field. |
| 76 | Muscillo Transport Fonsar (Italy) | Ailiamiante/ Alberti Mass Burn | . Within 80 km. of GTA<br>. No size quoted | A/A have wide European experience. |
| 77 | Montenay Inc./ Atlantic Packaging | Montenay to select best available Mass Burn Technology at RFP stage. | . Atlantic Pkg., at Whitby or elsewhere in GTA<br>. 1,500 TPD separated wastes | Montenay have had wide experience in EFW field. |
| 78 | Ogden-Martin | Ogden-Martin Mass Burn | . Not identified<br>. 3 Plants of 3,300 TPD capacity | Ogden-Martin have wide experience in N. America |

incinerators were not included in the EOIs received. Consideration should be given to their inclusion in RFPs for smaller scale facilities (less than 400 TPD) as an alternative to the larger facilities proposed.

## 6.3 WET OXIDATION

### Generic Description

The wet oxidation process consists of the treatment of wastes, in an aqueous slurry, by reacting the wastes with oxygen. The oxygen may be supplied by the introduction of air or pure oxygen. The reaction, which is similar to that occurring during the incineration of MSW, results from oxidation of the organic compounds in the wastes and produces carbon dioxide and water. The inorganic material forms solid residues, analogous to the formation of ash during incineration. This material can be filtered from the residual liquors and disposed of at a landfill site.

The rate of reaction is slower than the rates of destruction occurring during incineration, but this can be increased by raising the pressure in the reactor allowing higher temperatures to be utilized. The temperatures employed (generally about 280° C) are lower than those needed for incineration (800° C or above). The result of the lower temperatures is the reduced probability for the formation of hazardous by-products, such as dioxins or furans.

In principle the extent of the reaction can be limited by operation at suitable temperatures, pressures and residence times and useful by-products produced. However, unless adequate residence time is allowed, the effluent gases could be contaminated with the more volatile organic compounds formed by incomplete oxidation. The oxidation results in the release of heat which can be used for urban heating or industrial uses.

To date the wet oxidation process has not been commercially applied to municipal wastes.

### EOIs Received

One wet oxidation component (Kenox Corporation) was received. The proposal included a pretreatment step with separation of metal and glass, shredding and slurrying of the waste and blending of sewage treatment plant sludges. Their facilities would take 4,258 TPD (in eight, 650



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TPD units) of RDF and other separated organic wastes. The oxidation is carried out at 240°F under pressure. Heat is produced in the reaction which the respondent claims is suitable for steam heating or power generation. No specific GTA siting for the facility was specified except that a location near a sewage treatment plant was noted as being advantageous.
Kenox stated that a two-stage development program would be required to achieve a commercial scale operation. This would take eighteen months and $3.6 million funding to carry out.

Component Evaluation C.1

The wet oxidation process for MSW is not a proven technology at the scale proposed for GTA and therefore as a system component no further consideration should be given to implementation of this technology for the GTA at a full scale at this time.

**Summary**

The wet oxidation process is recommended for further consideration under R & D. It should be considered in conjunction with the disposal of sewage treatment plant sludges.



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## 6.4 VOLUME REDUCTION

Four EOIs propose components designed specifically for the reduction of the volume of waste.

EOI #13 (Dynaforce) proposes a mechanical shredder which claims the capability to reduce the volume of waste by up to 80%. While this system does not divert waste from landfill, the respondent indicates that the reduced material can then be composted to achieve a 20% diversion of waste.

EOI #71 (Env. Air) basically offers air structures to cover landfill operations and processing facilities. However, a generic processing system is described which produces waste bales which significantly reduces the volume of the incoming of raw refuse in volume.

Two respondents, EOI #50 (Alternative Environment) and EOI #70 (Faruk Fattah) describe volume reduction followed by encapsulation as a method of disposal. The general concept of encapsulation involves compression of waste by mechanical compaction followed by wrapping the waste with various combinations of metal binding, plastic, asphalt or concrete. The concept is to create an inert densified block of waste which will remain stable in a landfill or be useful as a building material or as RDF.

EOI #50 identifies a Japanese technology developed in 1965 and referred to as the Tezuka Kosan system. This system uses compression of waste to extract leachate from the waste. Several materials, as identified above are used for encapsulating the compressed waste. The primary use of the final product in Japan is for land reclamation, however, when the block is concrete coated the respondent claims that it can be used as a building block. While over 40 Japanese cities employ this system, it has not been used in North America. A U.S. Department of Health report raised many questions relating to the long term stability of the blocks (Source U.S Dept. of Health, Education and Welfare The Tezuka Refuse Compression System, Preliminary Report 1969). No further test or approval information could be obtained at this time.

EOI #70 involves only a conceptual design and differs from #50 by proposing to grind, dry and sterilize the waste before densifying and packaging. The final packages can be landfilled or used as RDF.



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Component Evaluation C.1

The mechanical shredder proposed by EOI #13 does not divert waste from disposal and is not proven for use on the GTA scale. The concept of covering landfill operations or processing plants with an air structure as proposed by EOI #71 has not been applied in any existing installations.

While EOI #50 has been used in Japan for land reclamation, it has not been employed in North America for disposal purposes. EOI #70 offers only a conceptual design.

None of the above EOIs propose to divert waste from disposal, however, this type of component or design could eventually be incorporated into a materials recovery system.

Summary

It is recommended that consideration not be given to these technologies for the GTA at this time. Monitoring of future developments under the R & D program are recommended.



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## 6.5 PYROLYSIS

### Generic Description

The process of pyrolysis is the separation and decomposition of organic compounds under the action of heat and in the absence of oxygen. Low boiling point materials may be directly vapourized or subject to breakdown into other compounds. Unless they are extremely stable, high boiling point materials, are normally converted to a mixture of volatiles or high carbon content non-volatile residues.

Municipal wastes containing organic matter can be subjected to pyrolysis in suitably designed chambers. The volatile materials produced can be withdrawn from the chamber as a gas and compressed or condensed to form a liquid. The residues remaining on the floor of the chamber are withdrawn as tars (a viscous pitch) or a solid char. This residue will also contain any non-volatile inorganic matter present in the feed material.

The pyrolysis can be achieved by the application of heat supplied by an external source, such as natural gas, or by partial combustion of the wastes using a restricted air supply. The reactors therefore are referred to as heated either directly or indirectly.

Direct heating involves a combustion zone inside the reactor fed by oxygen and/or air. A supplemental fuel such as coke or oil may be used.

Indirect heating requires a system to heat the reactor from the outside and a source of fuel to provide the heat. In some instances the products of the pyrolysis can be used as a source of fuel. However, in order to supply the heat needed to initiate the pyrolysis, a secondary fuel must be used.

Control of the heating rate or the air supply is critical to the operation of either system if the quantity and quality of the products are to be optimized. The composition of the products will also vary with the quality of the feed stock.

The gas, oil or residues produced will have some heating value and may be saleable as fuels or in some cases may be treated to produce saleable products. In the latter case processes similar to



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those used in oil refining or the production of coal products are employed. These include hydrogenation, fractional distillation and catalytic re-forming.

The commercial viability of these processes is dependent on the energy balance which can be achieved and the marketability of the products.

The advantages and disadvantages of the pyrolysis disposal technology are listed below:

**Advantages:**

- the system has the potential to reduce waste to a fuel and useable char and therefore does not require a landfill component provided bulky wastes are removed in advance and markets found for the by-products
- by-product fuels are transportable therefore there is no need to locate the facility close to energy users as is the case with an EFW plant
- processing of raw refuse is internal therefore potential for dust, litter, birds or other vermin problems largely eliminated if the facility is designed and operated properly.
- potential to reduce overall waste haulage costs if the plant can be located near major sources of waste generation.
- potential to reduce impact and displacement of agricultural landuses by reducing or largely eliminating the requirement for land disposal of refuse.
- sites can be returned to redevelopment following decommissioning of the facility.

**Disadvantages:**

- pyrolysis systems cannot be regarded as proven technology in the size range that would be of use in the GTA waste management program
- pyrolysis systems are complex and have been fraught with numerous operating problems
- a purely pyrolytic process inherently should not contribute to air pollution problems, because the gases produced are not vented. However, a combustion heat source will be required and if the pyrolysis gas stream is burned for combustion fuel, emissions in the form of particulate matter, acid and organic gases would require scrubbing and the resultant sludges disposed of in an acceptable manner.



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- ash/char by-product may prove difficult to market. The characteristics of these materials may pose problems with respect to their reuse or disposal as acceptable waste in a municipal landfill site.
- similar impacts with respect to traffic, odour, adjacent landuse and aesthetics as with EFW and RDF plants.

**EOIs Received**

Four respondents have offered pyrolytic processes. The four submissions are summarized on Table 6.3. Of these submissions two (EOIs # 4 and 7) form part of a potential long-term system of waste disposal. Their failure to include a landfill component indicates a reliance on the marketability of the products of pyrolysis.

A proposal to include the mining and recovery of wastes from existing landfills is included in EOI # 7 but no detail of methods of integrating this operation into the system is provided.

One proponent (EOI # 17) included magnetic separation and shredding of the wastes as a pre-processing step to prepare the raw wastes for pyrolysis. The pyrolysis is carried out using an indirect heating procedure requiring supply of a fuel. The fuel suggested is the gas produced by the pyrolysis. It is claimed that excess fuel is available for energy production.

EOI # 64 proposes to accept source separated and partially separated material, however, a further mechanical separation process is included in the proposal. The process requires an indirect heating procedure using the gas produced from the pyrolysis. An energy balance carried out during testing of a prototype unit, however, suggests that additional fuel may be required.

No firm evidence of the North American market value of the products from pyrolysis of MSW was supplied by any of the proponents.

**Common Features and Differences**

None of the proposed systems have been shown to be viable in North America. All systems claim self sufficiency for energy with some to spare.



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The methods of utilizing the gas or oil end products vary from partial use as a source of heat for operating the pyrolysis unit to total sale of the product as a fuel. In the latter case propane or natural gas is used as a heat source.

When the products (gas, oil or carbon) are used as a fuel source, pollution control equipment must be installed in order to remove particulate matter, acid compounds and some organic components from the exhaust gases. The submissions have either ignored or merely acknowledged this need. The methods to be used for control have either been inadequate or not clearly indicated.

None of the proponents give attention to the disposal of the ash when char is burned, or to the long term effects of the use of the char for other purposes. The leachability, metal content and organic compounds present are not examined in detail. The possible release of PCDD and PCDF in the residues is ignored. No method of purifying the carbon has been proposed.

EOI # 4 relies on partial direct heating (i.e. combustion of the waste) to provide heat for pyrolysis. A pre-processing step is included and the respondent claims 41.2 percent diversion from the total waste stream for the component.

EOI # 7 appears to use indirect heating (off-gas is compressible and storable as a saleable by-product) but does not state this. The respondent proposes to pre-process the MSW prior to pyrolysis, however, no estimate of waste diversion is specified.

EOI # 17 and # 64 use indirect heating; fueled mainly from the off-gas produced. Proponent #17 includes a pre-processing step but does not specify the quantity of waste diverted. Proponent #64 contains a pre-processing step with diversion calculated at 54 percent of the total waste stream.

All proponents and proposed systems are limited in experience at the scale of facility needed for the GTA waste.

Component Evaluation C.1

Table 6.4 has been prepared to compare the pyrolytic systems EOIs against the mandatory



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screening criteria outlined under Section 3.2. None of the pyrolytic systems received satisfy the mandatory criteria.

**Summary**

It is recommended that no further consideration should be given to this technology at this time as a full scale component in the GTA waste management system. However, it is recommended the technology be considered for further R & D support and for funding in a demonstration project following further review of the technical feasibility. It is also recommended that further clarification from the MOE be sought to determine if this technology should be classified as diversion rather than disposal.



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**Table 6.5.1**
**Summary of Pyrolytic EOI Submissions**

| E | Respondent | Type | End Product | Location | Comment |
|---|---|---|---|---|---|
| 4 | Dynavest International Inc. | Frontier Industries Inc. SWEPT 10 system. Capacity offered is several 240 to 480 TPD unit as required | Char and gas. | Not decided | No ash formed, no landfill needed. Demonstrated on 2 TPH scale. |
| 7 | Cogenesis Corp'n. | McMullen technology. 78 units @ 250 TPD proposed | Char and gas. | Existing landfill or transfer station preferred. Sites not identified. | See also RDF composting and mechanical recovery. No details of installations provided. No experience provided. |
| 17 | Waste Distillation | Proprietary technology no details given. Grouping of units based on 50 TPD modules | Gas and Char. No landfill needed. | No specifics. Seneca College and LBP Airport suggested. | Pyrolytic after separation and drying. Demonstration unit 50 TPD at Marcal Mills plant in N.J. |
| 64 | Wastech | Wastech technology Proposal is for 6 units located with GTA. Each unit would contain 10 reactors of 190 TPD capacity | Fuel gas and carbon | At landfill or transfer station in GTA. | Wastefeed to unit after separation and drying. Demonstration unit at 1 TPH capacity. |

Table 6.5.2
**Pyrolysis Conponent Evaluation**
**Against Mandatory Criteria C1**

| Proponent | Criterion C.1<br>Proven Success at Scale<br>Suitable for GTA |
|---|---|
| EOI #4<br>Dynavest International Ltd. | Not proven technology at scale suitable for GTA. One unit (2 TPH) installed in R&D facility at Frontier Industries Inc., St. Louis, MO the manufacturer of the system. Emission tests not validated. No sales demonstration for the end products |
| EOI #7<br>Cogenesis Corp. | Not proven technology at scale suitable for GTA. No information submitted to indicate the experience of the system proposed |
| EOI #17<br>Waste Distillation Inc. | Not proven technology at scale suitable for GTA. Relevant experience quoted is a 50 TPD unit, originally at Ford Motor Co. plant at Milpitas, CA and moved to Marcal Paper Co. in New Jersey. |
| EOI #64<br>Wastech | Not proven technology at scale suitable for GTA. Demonstration in Markham, Ontario has capacity of 1 TPH. System not proven on a commercial scale. |

## 6.6 LANDFILL

### Generic Description

The landfill component forms the final disposal element in any comprehensive waste management system. As previously stated, a portion of the solid waste stream as well as residues from processing facilities will require land disposal regardless of the other waste management technologies employed. This includes wastes from recycling, non-recyclable demolition debris, residues from incineration, RDF and composting operations, street sweepings, catchbasin cleanings and other non-processible wastes. In addition, a landfill performs a major security role in an integrated waste management system. It provides back-up capacity for other processing facilities in the event of major maintenance or mechanical breakdown, labour difficulties or a temporary market loss in the case of diversion activities.

Historic experiences have clearly demonstrated that a MSW landfill site can be a source of ground and surface water contamination and can also adversely affect air quality. In its simplest form, the problem can be stated in terms of water balance. Precipitation falling on the site either becomes surface runoff, returns to the atmosphere via evaporation and transpiration or infiltrates the MSW. The infiltrating liquids ultimately form leachate, liquids containing leached soluble and suspended contaminants. The liquids also provide the primary component for the generation of landfill gases.

The purpose of a landfill is to safely manage solid waste materials and the associated leachate for as long as they pose a potential threat to human health and the environment. This management can be achieved in two basic ways:

- by locating the landfill in a natural soil or rock formation which is sufficiently impermeable so that unacceptable movement of leachate and gases out of the landfill is prevented. This method is referred to as natural geological containment.
- by locating the landfill below the groundwater table and maintaining inward groundwater flow toward the landfill by pumping or gravity drainage and/or constructing man-made barriers or liners of sufficiently low permeability across the bottom and sides of the landfill to prevent unacceptable movement of leachate and gases out of the landfill. This method is referred to as engineered containment.



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In all cases some form of leachate collection, treatment and/or disposal would be provided. In some cases gas collection or treatment may be required.

Over the past decade the Ministry of the Environment has favoured the establishment of MSW landfills in areas where natural geological containment was available. However in the past few years the Ministry have issued policy statements and guidelines dealing with the concept of engineered containment. The basic requirement for permitting an engineered facility in Ontario can be summarized in the following:

> An engineered facility must function as long as necessary for the protection of the environment. If periodic or continuous maintenance or replacement is required, evidence must be provided by the applicant that this can and will be accomplished.

Source: MOE Policy No. 14-15
Engineered Facilities at Landfills That Receive Municipal and Non-Hazardous Wastes

Experience has demonstrated that a landfill facility properly designed and maintained will function well as a disposal component in a waste management system. The advantages and disadvantage associated with landfilling technology are the following:

**Advantages:**

- can meet current regulatory requirements if site properly designed, operated and maintained;
- provides a highly flexible and necessary disposal component for that portion of the MSW stream that cannot be recycled or reused;
- provides a major security element in a waste management system in the event of temporary downturn in recycling markets or mechanical breakdown of EFW, RDF or MRF facilities;
- disposal operations are relatively simple and therefore disposal of wastes can continue year round without interruptions;
- landfilling properly implemented is still the least expensive method of approved MSW disposal;



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- potential for reuse of site following closure for recreational/agricultural purposes if site properly designed and operated and final cover placement planned with end use in mind;
- waste in a landfill will eventually reach stability and not represent a source of air, ground and surface water contamination;

Disadvantages:

- unless the overall waste management system is well thought out, a landfill facility can be a threat to development of an effective 3Rs program;
- potential to displace large areas of agricultural lands. However, with engineered containment there is an opportunity to reclaim lands that have no economic future;
- potential to be source of air, ground and surface water contamination unless facility is properly sited, designed, operated and maintained;
- potential to be source of dust, noise, odours, bird and other vermin nuisance if not sited, designed and operated properly. These may be reduced considerably with an effective 3Rs program;
- potential for increased traffic congestion and reduction of access route capacity unless road systems are improved or transfer haul only policy adopted or site located where adequate capacity available;
- potential for negative visual impact from facility size and shape if site selection and final contour design not carefully considered;
- potential to impact negatively on the natural environment unless proper siting and design are undertaken to mitigate the adverse impacts;
- potential difficulty from low public acceptability of the technology due to historic landfill design and operation;
- potential for reduction in adjacent property values therefore fair compensation and mitigation policies must be adopted;
- provides no waste diversion although opportunity and space available to recover materials and/or energy from methane.

**EOIs Received**

The EOI responses are summarized on Table 6.5 with respect to:



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- Location
- Distance and Transportation Mode from GTA
- Identification of Landfill Operation or Land Only
- Host Community Status
- Site Studies or Government Approvals
- Previous discussions with Regions
- Potential Capacity
- Area of Land offered
- Potential life of the facility
- Current landuse of the land proposed

Table 6.6 summarizes the extent of studies by each.

Of the 86 respondents, 22 offered potential landfill components were identified (EOI #53 and #54 are the same respondent). Five of the respondents (EOIs #10, #28, #80, #84, #86) offered land only. One (EOI #81) proposed a conceptual lakefill design. The majority of landfill operations proposed include some form of on-site materials recovery or processing facilities.

Thirty-six sites were referenced by the respondents. Sixteen separate sites were specifically identified by location, while the remaining sites were only referred to in general terms. In some cases land was owned or optioned by the proponent.

**Common Features and Differences**

Total site capacities varied from 3.4 million tonnes (EOI #67) up to 70 million tonnes (claimed by EOI #70). Five proponents, (EOIs #5, #16, #34, #47 and #49) all of which included gravel, quarry or mining operations, identified capacities in the order of 20 to 25 million tonnes.

Distances to the sites varied from over 1650 km (Ignace, EOI #48, Maritimes EOI #73) to several sites at 500 km, to the majority located within 150 km of GTA or within the GTA itself.

Only respondent (EOI #38) supplied information indicating community support for the facility (Adams Mine in Kirkland Lake). Several others indicated that opposition was present either from local groups, the local municipality or both.



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The level of studies and government approvals was varied as shown (see Table 6.6). Seven respondents (EOIs #5, #16, #28, #34, #35, #47 and #53) reported some site preliminary investigations, while 3 respondents (EOIs #1, #49 and #67) had produced preliminary Environmental Assessment Information which they are in the process of submitting to the Regulatory Authorities. EOI #10 was involved in a previous 1988 EA hearing.

None of the sites proposed has received government approvals.

**Component Evaluation** (see Section 2)

Step C.1 - Mandatory

Landfilling of MSW is a proven technology with proven success of operation at a scale suitable for GTA.

Step C.2 - Three Important Factors

With landfilling accepted as a proven technology and with flexibility to incorporate future developments in waste management, screening of the EOIs under C.2 was based on the size and capacity of the facilities proposed, experience of the respondents in landfilling MSW and potential that the facilities proposed would have a chance of being permitted by the target operational date of 1996.

On the basis of the information received, it was decided that it would be premature to prepare a short-list of respondents who should receive RFPs for the landfill disposal component. Although additional information was requested during the EOI review process, the material received was still not sufficient to provide a short list that could be justified and not restrict the opportunities available to SWISC. Therefore, information must be obtained and decisions made on the specific criteria to be included in the RFPs.

The EOIs may be represented by the following classifications:



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- Insufficient information to allow any assessment of potential: EOIs #65 (Otto) and #63 (Surety) for landfill operations.

- Conceptual design only:

  EOI #81 (Methon) is a conceptual design that is not a new concept. The 1967 Metro Waste Management Study looked seriously at this technology. The basic hydraulic trap principle is the basis for the design of the Halton Regional landfill which was approved at Environmental Assessment Hearings in 1988. It is also the basis of several of the quarry landfill submissions.

  Current Ministry guidelines would prohibit lakefilling of MSW materials. This EOI has, therefore, been referred to R & D for additional consideration with respect to Ministry guidelines and its potential to increase the disposal options available to the GTA.

- Land only:

  EOI #10 (NSP Investments) has been subjected to an EA hearing: capacity is limited to 3.7 MT but it might be reconsidered by Halton for local use.

  EOI #28 (Superior Crawford) is tied closely to decisions with respect to the continuing operation of the Keele Valley landfill and the advice on further consideration of this EOI is required from the Region of York and Metro.

  EOI #80 (P.D.N. Temelini), #84 (William A. Hutchinson) and #86 (Standard Aggregates): more information is required on the basic, potential suitability of these lands to allow any decision to be made by SWISC on whether they would consider the investment in development of these lands would be warranted.

- Landfill operations at advanced stage for approvals:

  EOI #1 (Lamarche McGuinty)
  EOI #48 (Steetley Quarry Products)
  EOI #67 (Laidlaw Waste Systems)
  EOI #42 (BFI)



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Presumably these private sector landfill proposal will proceed without SWISC involvement. However, their potential role with respect to the long-term waste management plan and SWISC's involvement should be defined in the preparation of the RFPs.

- Landfill operations with preliminary information:

  EOI #5 (St. Lawrence Cement)
  EOI #16 (Armbro Materials)
  EOI #34 (Notre Development Corp.)
  EOI #35 (Enviromax Corp.)
  EOI #47 (Nelson Aggregate Co.)
  EOI #48 (Equity Waste Management)
  EOI #51 (Waste Management of Canada)
  EOI #53/#54 (Ontario Northland)
  EOI #70 (Faruk Fattah)
  EOI #72 (Markham Disposal)

  Additional information would be required prior to and in response to RFPs to allow SWISC to complete the evaluation of these EOIs.

Step C.3 - Common Specific Criteria

The comments below highlight the important features specific to each major criterion under the C.3 criteria. The detailed analysis of the common criteria for landfilling has been carried out for the Regions' Master Plans.

(a) Human Health and Safety

Landfilling of MSW has the potential to impact on air, ground and surface water quality if the facility is not properly designed, operated and monitored during the operational period and monitored and maintained during the post operational period i.e. through its contaminating life span. The monitoring, maintenance and institutional control (with respect to future site



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redevelopment) is an essential part of landfill technology and should be included along with comprehensive contingency plans in any site approval documentation.

(b)Natural Environment

Landfill facilities can have significant impact on the natural environment and therefore proper siting, design and operation are essential to their success.

(c)Social/Cultural

As above, a landfill facility can have significant impact on the social/cultural environment of the adjacent community. Again the attention to siting, design and operation of the facility is key to its success in the short and long term.

(d)Technical/(e) Planning Framework

The technical and planning issues surrounding landfill facilities have been extensively addressed in the Regions' Master Plans. None of the issues cited in these criteria would preclude selection of a landfill facility as a component in a waste management system.

Summary

Landfilling represents an important and necessary component for the foreseeable future in the long-term waste management plans for the GTA. There are a number of issues surrounding landfill design and operation that should be addressed in the R & D program in conjunction with support from the Province. These include:

- operation and post-closure infiltration measurements for design of cover systems
- leachate collection system performance
- landfill gas collection system performance
- clay liner performance
- plastic liner performance
- contaminating lifespan research
- leachate characteristics and treatment



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- improved management techniques and monitoring systems for screening materials that enter landfill facilities

For the preparation of the RFPs for landfill, several issues with respect to the suitability of the EOIs received have been identified and are addressed in Section 11.



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Table 6.6.1
Summary of Potential Landfill Sites

| EOI # | (a)Respondent Name<br>(b)Location<br>(c)Distance & Mode from GTA<br>(d)Operation or Land only | (a)Receptive Host Community<br>(b)Studies, Gov't Approvals<br>(c)Discussions, Metro/Regions | (a)Pot. Capacity<br>(b)Land Area<br>(c)Pot. Life (1)<br>(d)Current Landuse | Comments |
|---|---|---|---|---|
| 1 | (a)Lamarche McGuinty<br>(b)Bristol, Quebec<br>(c)390 km by CN or CP Rail<br>(d)Landfill operation | (a)Municipal approval expected 1992<br>(b)Prelim. EA completed<br>(c)Sent info. to Metro prior to REOI | (a)1 MTPY<br>(b)2400 acres<br>(c)7 years<br>(d)Open pit mine | - Total Capacity to be 29 MT: 20 MT available to GTA<br>(Associated MRF proposed to process up to 250,000 TPY: Section 5.4) |
| 5 | (a)St. Lawrence Cement<br>(b)7 sites in GTA<br>2 sites outside GTA<br>(c)No details<br>(d)Landfill operation | (a)Negotiations underway<br>(b)Planning, hydrological and eng. studies prepared<br>(c)No details | (a)10 to 30 MT<br>(b)No details<br>(c)3 - 10 yrs<br>(d)Gravel pits & limestone quarries | - Landfill capacity indicated no details<br>(Associated 100,000 TPD RDF into cement product: Section 6.1) |
| 10 | (a)NSP Investments<br>(b)Halton - Hwy #403 & King RD.<br>(c)In GTA<br>(d)Land only | (a)No details<br>(b)Part of EA hearing in 1988, alt'nate site chosen<br>(c)Originally selected as one of two preferred sites. | (a)3.7 MT<br>(b)78 ha<br>(c)1 year<br>(d)Open landuse designation | - Wish to transfer ownership to GTA/Region as soon as possible. |
| 16 | (a)Armbro Materials & Const.<br>(b)Marmora & Lake Townships<br>(c)190 km by Hwy or CP Rail<br>(d)Landfill operation | (a)No details<br>(b)Preliminary studies<br>(c)Discussions with Metro | (a)20 MT<br>(b)1950 acres<br>(c)7 years<br>(d)Open pit mine | (Possible site for materials recovery also.) |

(1) Based on GTA waste generation less diversion from Table 4.2 REOI beginning in 1996 and landfill disposal only.

Table 6.C.1
Summary of Potential Landfill Sites

| EOI # | (a)Respondent Name<br>(b)Location<br>(c)Distance & Mode from GTA<br>(d)Operation or Land only | (a)Receptive Host Community<br>(b)Studies, Gov't Approvals<br>(c)Discussions, Metro/Regions | (a)Pot. Capacity<br>(b)Land Area<br>(c)Pot. Life (1)<br>(d)Current Landuse | Comments |
|---|---|---|---|---|
| 28 | (a)Superior-Crawford Sand and Gravel<br>(b)Adj. to Keele Valley<br>(c)In GTA<br>(d)Land only | (a)No details<br>(b)Prelim. Eng. studies only<br>(c)No details | (a)10-15 MT<br>(b)192 ha<br>(c)3 - 5 yrs<br>(d)Gravel pit | (Possible site for materials recovery also) |
| 34 | (a)Notre Development Corp.<br>(b)Adams Mine, Kirkland Lake<br>(c)585 km by CN,CP and ONTC Rail<br>(d)Landfill operation | (a)Supported by Councils<br>(b)Prelim. EA studies<br>(c)Discussions with Metro | (a)25 MT plus<br>(b)8000 acres<br>(c)9 yrs plus<br>(d)Open pit mine | - On-site Materials Recovery being examined<br>- Associated Ind. Development proposed.<br>- Propose to take all of GTA waste |
| 35 | (a)Enviromax Corp.<br>(b)Haldimand, near Cayuga<br>(c)110 km by Hwy or Rail<br>(d)Landfill operation | (a)Local opposition<br>(b)Prelim. studies<br>(c)No details | (a)No details<br>(b)125 - 165 acres on 400 acre site<br>(c)No details<br>(d)Agricultural | - Landfill to handle waste from proposed Materials Recovery, and EFW plant: (Sections 5.4 and 6.2) |
| 42 | (a) BFI<br>(b) Ridge Landfill in Harwich Township<br>(c) 320 km by Hwy<br>(d) Landfill operation | (a) No details<br>(b) Application for site expansion underway<br>(c) No details | (a) No details<br>(b) No details<br>(c) No details<br>(d) Waste disposal | -Claim 240,000 TPY capacity available by 1991<br>-Currently preparing application to expand site capacity and allow receipt of wastes from Southern Ontario |

(1) Based on GTA waste generation less diversion from Table 4.2 REOI beginning in 1996 and landfill disposal only.

Table 6.6.1
Summary of Potential Landfill Sites

| EOI # | (a)Respondent Name<br>(b)Location<br>(c)Distance & Mode from GTA<br>(d)Operation or Land only | (a)Receptive Host Community<br>(b)Studies, Gov't Approvals<br>(c)Discussions, Metro/Regions | (a)Pot. Capacity<br>(b)Land Area<br>(c)Pot. Life (1)<br>(d)Current Landuse | Comments |
|---|---|---|---|---|
| 47 | (a)Nelson Aggregate Co.<br>(b)Uhthoff open pit between Orillia and Coldwater, Simcoe Cnty.<br>(c)130 km by Hwy or Rail<br>(d)Landfill operation | (a)No details<br>(b)Hydrogeological testing started<br>(c)Discussions with Metro | (a)13.5 - 52 MT<br>(b)193.7 ha<br>(c)4 - 18 yrs<br>(d)Gravel pit | |
| 48 | (a)Equity Waste Manage'nt<br>(b)Ignace & Kirkland Lake (Adams Mine see #34)<br>(c)1680 & 585 km respectively by Rail<br>(d)Landfill operation | (a)Supported by Councils<br>(b)No details<br>(c)No details | (a)No details<br>(b)No details<br>(c)No details<br>(d)Open pit mine | |
| 49 | (a)Steetley Quarry Prod'ts<br>(b)Dundas<br>(c)75 km by Hwy<br>(d)Landfill operation | (a)No details<br>(b)Draft EA submitted to MOE<br>(c)No details | (a)2 MTPY for 10-13 yrs<br>(b)167 ha<br>(c)See (a)<br>(d)Limestone quarry | (Propose Materials Recovery plant also: Section 5.4) |
| 51 | (a)Waste Management of Can.<br>(b)No Details<br>(c)No Details<br>(d)Landfill operation | (a)No details - negotiating<br>(b)No details<br>(c)No details | (a)1 MTPY for 20-30 yrs<br>(b)No details<br>(c)See (a)<br>(d)No details | (Propose Materials Recovery plant also: Section 5.4) |

(1) Based on GTA waste generation less diversion from Table 4.2 REOI beginning in 1996 and landfill disposal only.

**Table 6.6.1**
**Summary of Potential Landfill Sites**

| EOI # | (a)Respondent Name<br>(b)Location<br>(c)Distance & Mode from GTA<br>(d)Operation or Land only | (a)Receptive Host Community<br>(b)Studies, Gov't Approvals<br>(c)Discussions, Metro/Regions | (a)Pot. Capacity<br>(b)Land Area<br>(c)Pot. Life (1)<br>(d)Current Landuse | Comments |
|---|---|---|---|---|
| 53 | (a)Ontario Northland Trans.<br>(b)3 Landfill operations<br>Siting options | | | |
| | 1) Notre Development Corp.<br>Adams Mine, Kirkland Lk. | (a)Supported by Town Councils<br>(b)Preliminary work only<br>(c)Discussions with Metro | (a)25 MT plus<br>(b)8000 acres<br>(c)9 yrs plus<br>(d)Open pit mine | - Propose to take all GTA waste (Associated Ind. Development proposed: Section 5.4) |
| | 2) Northern Opport's Inc.,<br>No details | (a)No details<br>(b)No details<br>(c)No details | (a)No details<br>(b)No details<br>(c)No details<br>(d)No details | - Landfill for residues from proposed EFW in Kapuskasing included |
| | 3) Along ONTC Rail line between Kirkland Lake and New Liskeard, (as fallback option) | (a)No details<br>(b)Preliminary work only<br>(c)No details | (a)No details<br>(b)No details<br>(c)No details<br>(d)No details | |
| 65 | (a)Otto - Canada<br>(b)No details<br>(c)No details<br>(d)Landfill operation | (a)No details<br>(b)No details<br>(c)No details | (a)No details<br>(b)No details<br>(c)No details<br>(d)No details | |

(1) Based on GTA waste generation less diversion from Table 4.2 REOI beginning in 1996 and landfill disposal only.

Table 6.6.1
Summary of Potential Landfill Sites

| EOI # | (a)Respondent Name<br>(b)Location<br>(c)Distance & Mode from GTA<br>(d)Operation or Land only | (a)Receptive Host Community<br>(b)Studies, Gov't Approvals<br>(c)Discussions, Metro/Regions | (a)Pot. Capacity<br>(b)Land Area<br>(c)Pot. Life (1)<br>(d)Current Landuse | Comments |
|---|---|---|---|---|
| 67 | (a)Laidlaw Waste Systems<br>(b)3 locations for landfill operations | | | |
| | 1) Newcastle<br>In GTA | (a)Opposition, local groups Town of Newcastle<br>(b)EA document being prepared<br>(c)Discussions with Metro | (a)7.5 MT @ 2000 TPD<br>(b)57 ha<br>(c)2 years<br>(d)Agricultural | - 6 MT appears to be available for the GTA<br>- Based on approval of expansion of the site and service area |
| | 2) Warwick Township<br>245 km by Hwy or Rail | (a)Opposition, local groups Vil.of Watford/Warwick Twp.<br>(b)EA document being prepared<br>(c)No details | (a)7.0 MT @ 2000 TPD<br>(b)80 ha<br>(c)1.5 yrs<br>(d)Existing disp'l site | - 5.5 MT appears to be available for the GTA<br>- Based on approval of expansion of the site and service area |
| | 3) Ottawa West, Carlton Twp.<br>395 km by Rail | (a)No details<br>(b)Prelim. studies complete<br>(c)No details | (a)3.4 MT @ 900 TPD<br>(b)104 - 144 ha<br>(c)1 year<br>(d)Existing disp'l site | - Existing capacity. Propose to expand, however, no details on proposed expansion capacity |

(1) Based on GTA waste generation less diversion from Table 4.2 REOI beginning in 1996 and landfill disposal only.

Table 6.6.1
Summary of Potential Landfill Sites

| EOI # | (a)Respondent Name<br>(b)Location<br>(c)Distance & Mode from GTA<br>(d)Operation or Land only | (a)Receptive Host Community<br>(b)Studies, Gov't Approvals<br>(c)Discussions, Metro/Regions | (a)Pot. Capacity<br>(b)Land Area<br>(c)Pot. Life (1)<br>(d)Current Landuse | Comments |
|---|---|---|---|---|
| 70 | (a)Faruk Fattah<br>(b)Not given<br>(c)2 sites, 110 & 130 km<br>(d)Landfill operation | (a)No details<br>(b)Preliminary studies only<br>(c)No details | (a)50 and 70 MT<br>(b)300 & 350 ha<br>(c)17 & 23 years<br>(d)No details | (Potential site for FNF compaction, encapsulation, EFW, Section 6.2 and Composting, Section 5.4) |
| 72 | (a)Markham Disposal, Millar Paving<br>(b)Twp of Uxbridge, Durham Region<br>(c)In GTA<br>(d)Landfill operation | (a)No details<br>(b)Preliminary Studies only<br>(c)No details | (a)No details<br>(b)500 acres<br>(c)No details<br>(d)No details | (Associated Materials Recovery on site: Section 5.4) |
| 73 | (a)Surety Enviroment Inc.<br>(b)Maritimes<br>(c)2230 km by Water<br>(d)Landfill operation | (a)No details, negotiating<br>(b)No details<br>(c)No details | (a)6 MTPY EFW, 396,000 TPY to landfill<br>(b)No details<br>(c)No details<br>(d)No details | (Processing facilities in GTA to remove 35 % before shipping to EFW plant and landfill in Nfld.) |
| 80 | (a)P.D.N. Tremelini<br>(b)Northern Ontario<br>(c)No details<br>(d)Land only | (a)No details, negotiating<br>(b)No details<br>(c)No details | (a)No details<br>(b)No details<br>(c)No details<br>(d)No details | |

(1) Based on GTA waste generation less diversion from Table 4.2 REOI beginning in 1996 and landfill disposal only.

Table 6.6.1
Summary of Potential Landfill Sites

| EOI # | (a)Respondent Name<br>(b)Location<br>(c)Distance & Mode from GTA<br>(d)Operation or Land only | (a)Receptive Host Community<br>(b)Studies, Gov't Approvals<br>(c)Discussions, Metro/Regions | (a)Pot. Capacity<br>(b)Land Area<br>(c)Pot. Life (1)<br>(d)Current Landuse | Comments |
|---|---|---|---|---|
| 81 | (a)Methon Energy Corp. Inc.<br>(b)Lake Ontario<br>(c)Near GTA<br>(d)Landfill operation | (a)No details<br>(b)No details<br>(c)No details | (a)No details<br>(b)No details<br>(c)No details<br>(d)Lake | - Design philosophy only provided. |
| 84 | (a)William A. Hutchison<br>(b)Laxton Township,<br>Victoria County<br>(c)135 Km by Hwy<br>(d)Land only | (a)No details<br>(b)No details<br>(c)No details | (a)No details<br>(b)1100 acres<br>(c)No details<br>(d)No details | |
| 86 | (a)Standard Aggregates<br>(b)Several Locations<br>(c)No details<br>(d)Land only | (a)No details<br>(b)No details<br>(c)No details | (a)No details<br>(c)No details<br>(b)No details<br>(d)No details | |

(1) Based on GTA waste generation less diversion from Table 4.2 REOI beginning in 1996 and landfill disposal only.

Table 6.6.2
Potential Landfill Operations and Sites
Extent of Studies by Respondents

| EOI # | Respondent Name | Description of Studies |
|---|---|---|
| 1 | Lamarche McGuinty | Supporting documentation indicates that this project has been authorized in principle by the Quebec MOE. The authorization is conditional on compliance with solid waste regulations, recommendations of the Hazardous Wastes Department and landfill operations requirements and support of the local municipality. The necessary local municipal support has not been obtained to-date and a court action is pending on the local municipal authority on the matter. Technical documentation is extensive. |
| 5 | St. Lawrence Cement | Respondent claims that planning hydrogeological and engineering feasibility studies have been "satisfactorily" completed on the potential sites. No documentation was submitted. However, the respondent intends to share the results with municipal authorities and public in early 1990. |
| 10 | NSP Investments | This site was part of a Joint Board Hearing in 1987. An alternative site was chosen as the preferred site for a sanitary landfill in Halton. |
| 16 | Armbro Materials & Const. | Some preliminary site assessment study results (hydrogeological and site development) were provided. It was indicated that Metro will be conducting preliminary site evaluation studies, soil testing etc. in the near future. |
| 28 | Superior-Crawford | Claims to be included in the Provisional Approval issued by the MOE for the existing Keele Valley Landfill. Supporting information on preliminary engineering studies was not provided. |
| 34 | Notre Development Corp. | Claims that the project was backed by the local government were supported by letters of reference. Preliminary EA studies supported by documentation provided. |
| 35 | Enviromax Corp. | Claims of enviromental analysis and hydrogeological studies were supported with documentation. |
| 42 | Browning Ferris Ind. | Claim application currently being prepared for site capacity and service area expansion. |
| 47 | Nelson Aggregate Co. | Preliminary hydrogeological and engineering studies were supported with documentation. |
| 48 | Equity Waste Manage'nt | No studies reported. |
| 49 | Steetley Quarry Prod'ts | Reference to and documentation of the draft EA submitted to the MOE and other authorities was provided. |

**Table 6.6.2**
**Potential Landfill Operations and Sites**
**Extent of Studies by Respondents**

| EOI # | Respondent Name | Description of Studies | |
|---|---|---|---|
| 51 | Waste Management of Can. | No studies reported. | |
| 53 | Ontario Northland Trans. | Siting Options: | |
| | | 1-Notre Development Corp. Adams Mine, Kirkland Lk. | -Refer to EOI #34 |
| | | 2-Northern Opport's Inc., No details | -No studies reported. |
| | | 3-Along ONTC Rail line between Kirkland Lake and New Liskeard | -Preliminary study area constraint mapping was provided. |
| 65 | Otto - Canada | No studies reported. | |
| 67 | Laidlaw Waste Systems | Newcastle | -Indicated that EA submission documents were being prepared and were available. |
| | | Warwick Township | -Indicated that EA submission documents were being prepared and were available. |
| | | Ottawa West, Carlton Twp. | -Documentation not provided to back claims of studies performed to-date. |
| 70 | Faruk Fattah | Provided preliminary hydrogeolical imformation only. | |
| 72 | Markham Disposal | No studies reported. | |
| 73 | Surety Enviroment Inc. | No studies reported. | |
| 80 | P.D.N. Tremelini | No studies reported. | |
| 81 | Methon Energy Corp. Inc. | No studies reported. | |
| 84 | William A. Hutchison | No studies reported. | |
| 86 | Standard Aggregates | No studies reported. | |

# 7.0 OTHER COMPONENTS

## 7.1 TRANSPORTATION TO PROCESSING/DISPOSAL FACILITY(ies)

Historically, solid waste has typically been transported by truck, however, rail haul and shipping by water have received more consideration in recent years in other jurisdictions in North America. The mode employed depends on the nature and volume of the waste, the distance between facilities and the alternative transportation facilities available. Long distance hauling of solid waste is becoming increasingly common as acceptable disposal facilities are more difficult to locate near sources of waste generation. In the United States, MSW is transported by rail to disposal facilities up to 400-500 miles away. (Paula and Anthony Voel, Shrinking Northeast Fills Force Long-Distance Hauls, World Wastes, March 1988.)

With the exception of Halton Region, waste generated within the GTA is processed and/or disposed of locally at the present time, using conventional truck transportation methods.

### 7.1.1 EOIs Received

Transportation to processing/disposal facilities was addressed to some extent in most of the EOIs. The level of detail provided varied from one sentence stating the preferred methods to those offering transportation as the sole component. Responses were separated into categories based on the mode of transportation proposed: truck haul, shipping by water and rail haul.

Transportation of solid waste within the GTA by truck was the preferred approach of most EOIs. Transportation to facilities outside of the GTA was suggested by numerous means. The following list describes the preferred transportation mode to sites outside the GTA.

| EOI # | | Location | Transportation Type |
|---|---|---|---|
| 1 | Lamarche McGuinty | Bristol, PQ | - rail with a transfer facility at Brock Landfill |
| 12 | Desautels & Detering | Caledonia, Ont. | - truck and trailer |
| 15 | Expocrete | Flamborough, Ont. | - truck and trailer |



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| | | | |
|---|---|---|---|
| 16 | Armbro | Marmora, Ont. | - rail and/or truck haul |
| 20 | See-Bah | Sault Ste. Marie, Ont. | - prefer water but will use rail or truck during winter months |
| 31 | Reuter | Sarnia/Kettle Point, Ont. | - truck and trailer |
| *34 | Notre Development | New Liskeard, Ont. | - rail haul |
| 35 | Enviromax | Town of Haldimand | - truck or rail haul |
| *43 | Stinnes | Kapuskasing, Ont. | - rail haul |
| 47 | Nelson Agg. | Orillia, Ont. | - rail haul |
| 48 | Equity | Ignace, Ont. | - rail haul |
| 49 | Steetley | Flamborough, Ont. | - truck and trailer |
| *53 | Ontario Northland | New Liskeard, Ont. | - rail haul |
| 67 | Laidlaw | Watford, Ottawa, Ont. | - rail or truck haul |
| 73 | Surety | St. John's, Nfld. | - water haul |
| 84 | W. Hutchinson | Victoria Road, Ont. | - rail haul |

*Proposed in conjunction with #52 (Ontario Northlands)

7.1.1.1 **Shipping by Road**

Very little detail was provided in the numerous submissions proposing the use of truck and/or trailer combinations to haul waste. No EOI proposed to haul the total GTA wastestream. Several EOIs alluded to the concept of providing trucks in association with components or systems that they proposed, but the trucking component was not described in any detail.

Several proposals suggested modified truck or trailer combinations for collection and transfer of wastes. A clear distinction was not made in many cases between collection, transfer and long distance hauling of waste. Notable variations on traditional trucking methods included:

| | | |
|---|---|---|
| EOI #9 | Foster Wheeler | - specialized trucks dedicated to specific materials |
| EOI #21 | Round-up Inc. | - two compartment trucks for wet/dry materials |
| EOI #26 | Igloo Recycling | - special trucks to pick up igloo containers |
| EOI #31 | Reuter Inc. | - rapid rail automated pick-up system which requires only one operator |



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| | | |
|---|---|---|
| EOI #51 | WMI | - WMS Packers for collecting residential waste |
| EOI #55 | Dual Environmental | - specialized trucks dedicated to specific materials |
| EOI #60 | Envirotech | - modified trucks for compostables and recyclables |
| EOI #72 | Markham Disposal | - trucks piggy-backed with rail cars |

Other EOIs providing any information on trucking as the preferred method of transportation included EOI #48 (Equity Waste Management Ltd.), EOI #51 (WMI), EOI #65 (Otto Canada) and EOI #67 (Laidlaw Waste Systems Ltd.).

Detail contained in the trucking proposals is insufficient to complete a thorough examination of this component. However, trucking represents a conventional approach to local transportation alternatives which have been proven to operate successfully on the GTA scale.

### 7.1.1.2 Shipping by Water

Shipping by water to transport waste materials is suggested in two EOIs:

**EOI #20 (SEE-BAH Waste Elimination Technologies Ltd.)**

This EOI requires that waste materials be delivered by ship to the processing facility in Sault Ste. Marie. The recovered product would also be distributed by ship. Secondary transportation options call for rail or truck haul. No other transportation details are provided.

**EOI #73 (Surety Environmental Inc.)**

Surety proposes to ship 6 million tonnes of waste per year from a receiving/processing facility in the Toronto Harbour lands to EFW facilities in the Maritimes. Again, the problem of winter shut-down of the St. Lawrence Seaway is not clearly addressed. Storage at the processing/receiving site is indicated. No other details concerning transportation are provided.

### 7.1.1.3 Shipping by Rail

Four EOIs were submitted offering rail haul as a feasible transportation mode. EOIs #52, #61, #62 were put forward by rail companies while #48 (Equity) proposed rail as an integral component of their system.



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**EOI #52 (Ontario Northlands Transportation Commission (ONTC))**

Ontario Northlands proposes to haul waste from a new rail terminal in the GTA to processing/disposal facilities north of North Bay, Ontario and distribute recyclables to markets by rail. The haul between Toronto and North Bay would be tendered to CN Rail or CP Rail. The ONTC system would be used for the remainder of the distance to the waste processing and disposal facilities near Kirkland Lake and/or Kapuskasing. This EOI is very detailed and is submitted in conjunction with Ontario Northland's system proposal (EOI number 53).

ONTC's transportation plan is made up of six components:

1. methods of rail transport
2. waste transfer to rail terminals
3. use of existing transfer stations in the GTA
4. direct haul to rail terminals in the GTA
5. rail operations
6. northern receiving rail terminal

Three methods of rail transportation are proposed by the ONTC:

a) unit trains using special top loading cars
b) compacted waste in shipping containers
c) baled waste in boxcars

The use of top loading unit trains is ONTC's preferred long-term method of transporting GTA waste. Open top boxcars with removable covers will be able to carry 36-55 tonnes per car of uncompacted MSW. This system will be similar to the one hauling waste to the SEMASS waste to energy facility in Rochester, Massachusetts. Cars are wheeled into pits below the tipping floor and filled from the top by bulldozers pushing waste over the edge of the floor. Knuckleboom cranes compact waste as it is loaded. A typical SEMASS rail transfer station handles 2 cars at a time and has a daily design capacity of 900 tonnes.

ONTC's second alternative, which could be used in the short or long term involves hauling compacted waste in shipping containers. Standard ISO metal containers are 8.5' x 8' x 40' in size and can be stacked 2 high on specially designed flat bed rail cars. Five basin, articulating, double stack container cars are manufactured by Thrall Manufacturing Company of Chicago Heights, Illinois and the Gunderson Company of Portland, Oregon. Shipping containers are not



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designed to handle the pressure of common horizontal ram compactors so special compactors such as the Trans-Pak series manufactured by Amfab Resources Company of Woodburn, Oregon must be used. This compactor creates a bale 7' x7' x 38' which fits conveniently into a specialized container.

Shipping baled waste in boxcars is a short-term method of transport and is least preferred by the ONTC. The installation of baling machines at existing transfer facilities and a rail head terminal ensures minimal impact to GTA's existing waste management system. MSW will be compacted into dense rectangular bales which are held together by metal straps. Standard boxcars (40 x 9'2" x 10'6") can be used to transport these bales. One series of balers, MOSLY SWS, creates a bale size designed specifically to fit inside rail boxcars and transport trailer vans.

Quantities to be Transported:

- 4,000 tonnes per day with respect to initial MRF proposed, with eventual expansion to 8,000 TPD to MRF
- 4,000 TPD to proposed EFW in Kapuskasing
- total up to 12,000 tonnes per day for both MRF and EFW
- additional volumes as required for disposal

Estimated Time in Transit (one way):

| | |
|---|---|
| Allowance for receiving and loading at yard | 12 hours |
| Transit time (Toronto to North Bay) | 6 hours |
| Car checking (North Bay) | 1 hour |
| Transit time (North Bay to MRF facility) | 5 hours |
| Total | 24 hours |

**EOI #61 (CN Rail and Bechtel Canada)**

CN Rail's proposal, appropriately entitled 5Rs (Reduction, Reuse, Recycle, Recover and Rail) is based on an intermediate processing and benefication facility (IPBF) designed by Bechtel Canada Inc. The system is designed to transport by rail residual wastes and marketable recovered products in a safe, clean and environmentally acceptable manner. Included also in this submission is an intermodal rail transportation and container facility (IRTCF). The IPBF and IRTCF will be located at C.N.'s McMillan Rail Yards in Vaughan. This EOI is significantly detailed for further consideration as a component for total systems. It is unclear whether CN



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Rail would submit a proposal to provide transportation independent of the intermediate processing and benefication facility.

CN's preferred method of transporting waste is containerization of baled waste. A compactor will be used to create a bale 7' x 7' x 37' which will be loaded into CN containers measuring 8' x 8' x 40'. These containers will then be double-stacked onto a 6,000 ft. unit train and distributed to markets or disposal facilities.

Quantity to be Transported: 6,000 tonnes per day
Estimated Time in Transit (one way):

| | |
|---|---|
| Preparation and Loading | 5 hours |
| Time in Transit (Southern Ontario) | 5 - 8 hours |
| (Northern Ontario) | 15 - 20 hours |
| Total | 10 - 25 hours |

**EOI #62 (Canadian Pacific Rail)**

The Intermodal Freight Systems unit of CP Rail proposes the rail haul of solid waste from the GTA to points identified for processing/disposal, where such points can be accessed both technically and economically by CP Rail. The expression of interest is very detailed and could form a transportation component for a long-term waste management system.

The railhaul system is based upon the following:

1. the operation of dedicated trains for solid waste transport
2. rapid handling and transit through effective train scheduling and the establishment of a rail infrastructure that will minimize solid waste train delays
3. the utilization of dedicated rolling stock for use in solid waste service
4. the building of solid waste trainloads at railhead(s)/railyard(s) if and where technically and economically feasible for CP Rail
5. CP Rail would be interested in expanding the railhead/railyard operation as noted in (4) above, to encompass the transfer of solid waste from incoming road vehicles to outbound railcars



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CP Rail's system would use existing, and potentially new, rights-of-way and existing, and potentially new, railway yards and supporting rail infrastructure. No specific sites for these facilities are identified. A scenario presented by CP Rail would see 3 trainloads, each carrying 3,800 tonnes, departing from loading facilities in the west, north and east GTA.

CP Rail does not state a preferred railcar configuration since handling, transfer and processing/disposal components will determine the ultimate type used. Nevertheless, this EOI suggests:

1. Containerization
   a) modified containers on flatcars (COFC) - 40' x 8'6" x 8' 6", steel reinforced, double or single stack units with swing end walls
   b) modified trailers on flatcars (TOFC) - 40' x 8'6" x 8'6", steel reinforced intermodal container with swing end walls
   c) modified Road Railer units (Mark V units) - 48' x 13'6" x 8'6", special road and rail units which are coupled with a rail bogie for operation on rail

2. Conventional Railcars
   a) modified boxcars - 85' x 9'2" x 11'6", steel reinforced, side sliding all-door boxcar for baled waste handling or 60' steel reinforced, rotary dump, top loading and unloading boxcar
   b) modified gondola cars - 65' x 9'2" x 9'6", rotary dump, top loading and unloading cars with fixed opening or removable covers.

CP Rail plans to model its transportation component after the one serving the Greater Manchester area in Great Britain. A four page brochure detailing the Manchester experience is contained in the report.

Amount Transported: 11,400 tonnes per day (3,800 tonnes/day/corridor x 3 corridors north, east, west.

Estimated Time in Transit (one way): 24 hours depending on identification of the specific origin and destination sites.



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**EOI #48 (Equity Waste Management of Canada Corporation)**

Based on a review of two major rail haul systems in England and Holland, Equity proposes an integrated road/rail transportation system based on intermodal ISO containers. Waste deliveries to existing transfer stations or the Respondent's proposed integrated transfer/processing facilities will be performed by the established collection agents. Any transfer between facilities over 50km apart will be handled by rail or a hybrid road/rail system. Construction/demolition materials and other bulky goods will be transported by rail using heavy duty, open topped, rail cars or trucks with bin bodies and covering tarps. Other products or waste materials will be compressed and loaded into fully-enclosed containers. An intermediate storage facility is considered undesirable by the respondent due to the expense of double handling, additional storage site requirements, difficulties with waste loading and unloading and sanitary conditions. Equity included a video tape describing the (Hi-Rail) approach used by British Rail.

Specific Consideration of Rail Car Types

Several alternatives with respect to the handling of wastes in a rail haul system were submitted and are described below. The advantages and disadvantages of each were summarized in the Ontario Northlands proposal and are reproduced here to assist in the evaluation of this component.

Rail Car Configurations - Advantages and Disadvantages.

(a) Unit Train Rail Cars

Advantages

- The speed and simplicity of the loading and unloading of the cars translates into minimal operating and maintenance costs.
- With the lid in place on top of the waste in the car, it represents an environmentally benign method of transporting the waste.
- Handling of the waste and the need for specialized handling equipment is minimized.
- Baled waste can be placed directly into the cars, if necessary.
- The loading system provides the maximum flexibility for handling different



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categories of waste for separate processing at the processing end of the system.

- The cars can be used for backhauling recovered materials to the GTA.
- Maintenance requirements for the new cars should be no different than what will be required for the container or bale based system rail cars.

Disadvantages

- The basic layout of the unit train station is not compatible with the facilities required for handling shipping containers or baled wastes.
- Specialized equipment is required for rapidly unloading the rail cars.
- A number of special rail cars will need to be purchased and fitted with lids.

(b) Compacted Waste in Shipping Containers

Advantages

- A shipping container is an enclosed and leakproof unit and thus it represents an environmentally benign method of storing and transporting solid waste.
- Because shipping containers are much lighter than transfer trailers, higher waste loads are possible. This may result in lower transportation costs.
- Shipping containers can be stacked several units high, resulting in lower storage space requirements for both empty or full containers.
- Shipping containers are relatively inexpensive and can be easily purchased in large quantities.
- Filled containers can be stored at the transfer stations or at the rail head terminals, resulting in increased operational flexibility.
- Empty containers can also be used to backhaul recovered materials to the GTA.
- The number of containers being used in the system can easily be adjusted in order to accommodate changes in the amount of waste that needs to be handled.
- Containers deemed unfit for further use can be sold to several companies in the Toronto area that specialize in upgrading used containers for the storage of PCBs or for general storage.

Disadvantages

- A large number of containers will be required.



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- Special equipment will be required to load and unload, handle and transport the containers.
- The upkeep and maintenance of the large number of containers may be costly.

(c) Bales Placed in Boxcars

Advantages to Baling Waste

- Baling machines are capable of producing bales having waste densities of up to approximately 1000 kg/m3, which is much greater than the compaction densities attainable using conventional compaction systems (i.e. transfer trailers). Thus transporting bales is more cost effective than most other common transportation methods.
- Bales can be transported using a variety of vehicles, including enclosed transport van trailers, flatbed trailers, railway boxcars, flatbed rail cars and shipping containers.
- Because uncontained bales can be transported using flatbed rail cars or truck trailers, higher load weights can be realized.
- Bales can be easily handled using either fork lift trucks or front end loaders with forks installed on the front.
- Waste is generally fed into baling machines using a conveyor system. This encourages front-end recycling because recoverable materials can be easily lifted off of the conveyor by designated personnel.

Disadvantages

- The maximum capacity of a baling machine is fixed and this may result in extra operating hours being required to handle all the incoming waste.
- Baling machines that are presently available have a maximum throughput of approximately 55 tonnes/hour, which is less than the approximately 100 tonnes per hour that can be handled by compactors.
- Large and bulky waste items can be difficult to bale, thereby necessitating pre-treatment or provision for a separation area for non-baleable waste.
- Once the waste has been baled, the feasibility of recovering some recyclable materials (glass, etc.) is reduced.



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- Certificates of Approval for the existing transfer stations may have to be amended in order to allow the waste to be baled.
- The existing transfer stations will likely require more structural modifications.

7.1.2 Evaluation of Transportation as a System Component (See Section 2)

The following aspects of Road, Rail and Shipping by Water alternatives are identified for consideration in the evaluation of potential systems.

Step C.1 - Mandatory Criterion:

Proven success of operation at a scale suitable for the GTA.

Road:

The hauling of waste by truck and trailer on the Provincial road system is a proven technology which is currently used in the GTA.

Shipping by Water:

Shipping of waste by water is a method which does not have proven credibility on a scale suitable for the GTA. Although some agencies ship their waste out to sea for disposal, distances are usually short and ships (barges) operate on a regular schedule. Both EOI shipping proposals require storage and processing of waste along Toronto's waterfront. Storage or alternative transportation is necessary over the winter months while the waterways are closed. Since neither proposal offers any substantial information on proven shipping systems, this mode of transportation is not considered proven for the GTA at this time. No further evaluation of this alternative is therefore considered.

Rail:

The hauling of waste by rail has been used in Europe since the 1950s and continues to provide an effective and proven method of transporting millions of tonnes of waste. Popular in Great Britain, Switzerland, The Netherlands and West Germany, rail haul of waste has developed in



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the United States since 1975 and has proven successful. It is expected that just one company, CSX, will haul 5 million tonnes of waste per year by rail in the United States by the early 1990s.

Despite the success of rail haul of MSW world-wide, most existing systems carry no more than 1,000 tonnes per day. (Feindler, Klaus S., Refuse Rail Haul: The Missing Link to Resource Recovery in Montgomery County, International Conference on Municipal Waste Combustion, Ottawa: Environment Canada, 1989). Several systems in the world are capable of handling 2,000 tonnes per day in particular British Rail and Netherlands Rail. A recent Request for Proposals for rail haul of MSW in Los Angeles received 10 responses, all of which proposed rail haul of between 3000-6000 TPD (Waste Age, October, 1989).

A GTA waste transportation system, based entirely on rail haul, could necessitate the movement of up to 14,000 TPD (365 day basis, year 2000). Despite the fact that rail haul of MSW has not occurred at this scale, rail haul of other bulky materials of this mass occur daily. According to Canada's two main rail haulers, CN Rail and CP Rail, intermodal freight as well as coal, potash and grain are regularly transported over distances and for quantities exceeding the requirements of the GTA. Both companies also confirm that existing track capacity exists in Southern Ontario to haul MSW from the GTA without delays.

Step C.2: Three Important Factors

Based on examples of MSW rail haul elsewhere in the world and information provided by the respondents, rail haul is a proven technology at the GTA scale.

- Demonstrated ability to meet environmental requirements.

  Road: Road hauling can meet all environmental requirements, if properly designed.

  Rail: Rail hauling can meet all environmental requirements, if properly designed.

- Flexibility of the component to incorporate future developments.

Road: Transportation by road is generally the more flexible option.



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Rail: Rail also can provide flexibility to meet any future developments, provided contingency provisions are built into the system.

- Operation by 1996 at latest.

Road: Trucking of waste is currently in operation within the GTA and any expansion of trucking could be done so readily.

Rail: Rail systems are already in place. Operation of railway haul could be readily achieved, provided the processing and disposal facilities selected are located in reasonable proximity to existing rail lines.

Step C.3: Common and Specific Criteria

In view of the lack of specific sites and relevant details for alternative systems the features of road and rail transport are addressed in general terms only. The criteria in Table C.3 would be elaborated upon and addressed in detail following receipt of RFPs.

(a) Human Health and Safety:

Road:

- the potential for contamination of surface or groundwater would only be related to spills or litter from vehicles
- trucks have higher air emissions than rail: noise is an important factor
- increased traffic on the roads can increase safety risk
- nuisance factors can be mitigated with control of vehicles covering: more difficult to enforce than rail
- trucking can distribute the impacts over a broader area and reduce local impacts
- trucks and road systems require regular maintenance

Rail:

- the potential for contamination of surface or groundwater would only be related to spills
- minor contributor to air emissions: noise from trains is more isolated except for railyards
- potential for nuisance factors would be minimal



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- trains have high public confidence
- railway operations are contained within a controlled corridor
- rail has an exceptionally low number of accidents over distance hauled
- trains, tracks and containers require a regular maintenance program

(b) Natural Environment:

Assuming existing tracks are used, potential impacts on the natural environment through transportation of wastes would mainly stem from accidents and spillage. For solid wastes the risks can be confined to short-term impacts. The likelihood of accidents with road haul is higher but the quantities involved in any one accident would be much less.

(c) Social/Cultural:

Road:

- truck haul would require transfer facilities within the GTA
- trucking is an acceptable form of transporting waste
- roadways are already in place
- increased wear and tear on roadways

Rail:

- rail haul would require loading facilities within the GTA
- rail is an acceptable form of transporting waste
- rail lines are already in place
- rail could significantly reduce truck traffic on congested highways

(d) Technical:

Truck:

- advancements in truck designs are occurring
- future developments and trends in waste composition and quantities can be accounted for
- trucking has relatively higher energy requirements than rail; distance and amount hauled are determinants
- ownership and operation options are flexible up to a certain point



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- component can be easily incorporated into the waste management system
- collaborative efforts more easily facilitated through trucking
- generally more economical for distances under 100 km

Rail:

- advancements in design of railway cars and containers are occurring
- future developments and trends in waste composition and quantities can be accounted for
- rail has relatively lower energy requirements than truck; distance and amount hauled are determinants
- ownership and operation options are flexible
- component can be easily incorporated into waste management system
- rail may be less suited for collaborative efforts due to operations and network limitations
- train loads are more easily traceable
- generally more economical for distances over 100 km
- trailers and other transporting devices can become frozen
- waste may freeze while on route during extreme temperatures
- loading and unloading facilities entail a high financial cost.

(e) Planning Framework:

Road:

- trucks can last up to 10 years with regular maintenance
- trucks can meet the short term need
- EAA, EPA approvals not required
- trucks already operating, new transfer facilities may take 6 months to construct
- less vulnerable to strikes or major accidents

Rail:

- trains and containers last up to 20 years; track 40 years
- rail can meet the short term need
- EAA, EPA approvals not required



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- trains already operating, new containerization or loading facilities may take 2 years to construct
- trains are less affected by severe weather

(f) Specific Criteria:

(i) Complexity of the system.

(ii) Suitability with respect to existing transportation systems.

Both of these criteria were intended to assist in comparing specific systems. In general, road haulage would be less complex for local facilities whereas rail haulage may be less complex for remote facilities. In either case their suitability would relate to the existing transportation facilities pertinent to specific facility locations. The rail alternatives are based on utilization of existing rail systems rather than major expansions of these systems.

### 7.1.3 Summary

The hauling of waste by truck and/or rail are alternatives which could be easily incorporated into a long-term solid waste management plan for the GTA. The final determinant will be the type and location of the facilities chosen for the GTA. Distance plays a major role in determining the economic advantages of one system over the other. The use of intermodal containers, a container which can be directly transferred between trucks and rail cars, can increase system flexibility and suitability by gaining the best from both options.

Rail haul is an acceptable option for transporting solid waste to processing and/or disposal facilities. A further evaluation of rail transfer facilities, car type, scheduling, handling and cost effectiveness will be necessary at the RFP stage.



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## 7.2 RESEARCH AND DEVELOPMENT (R & D)

This section includes respondents who submitted information related to a research or demonstration component (as requested in the REOI). Conceptual ideas or components which have not traditionally been used for waste management in the GTA.

### 7.2.1 Research and Demonstration Projects

**Facilities - 5 EOIs offer specific locations or information relating to the development of R & D centres:**

- #8 (Lavalin) offers to establish a Research and Development (R & D) centre at the current Urban Transportation Development corporation (UTDCC) facilities located in Kingston.
- #34 (Notre) will establish an R & D centre at the site of the processing facilities.
- #48 (Equity) - while not providing a specific location, gives a specification for an R & D centre in the GTA in association with the Management of Technology Institute.
- #79 (ORTECH) proposes to form a GTA Centre for Waste Reduction and Research at their existing facilities in Mississauga.
- #72 (Markham/Miller) - will consider on-site facilities in the GTA.

**Demonstration Projects - 5 EOIs propose demonstration size facilities.**

- #20 (See-Bah) requests funding for a demonstration project relating to the conceptual idea described later in this section.
- #38 (Redipac) offers to use one of their existing plants as a demonstration project for research into the recovery of plastics, food waste and health care product waste.
- #58 (Weldex) proposes testing of the UEI rotary kiln incinerator on a demonstration plant scale.
- #70 (Faruk Fattah) requests funding to demonstrate the volume reduction technology described in this section.
- #74 (Bedminster Bio) proposes a demonstration size plant (200 TPD) which uses in-vessel aerobic composting technology



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**Continuation of Existing R & D Projects** - 3 EOIs reference existing R & D projects which could be included in GTA R & D programs:

- #11 (Proctor and Gamble) - indicate that research is being conducted into the composting and recycling of disposable diapers in two locations in the U.S.
- #33 (TCPL) - is interested in participating with the GTA or respondents who offer power generation from waste, the production of biogas and gasification of waste.
- #77 (Montenay) - propose to continue research into the vitrification of ash produced from waste incineration plants.

**Monitoring** - Two EOIs expressed monitoring capabilities:

- #6 (Buhler-Miag) references the capability to monitor composting operations in Switzerland as part of their R & D project.
- #51 (WMI) indicate that they have laboratories in Geneva, Illinois which are used in a quality assurance role for all WMI operations, particularly landfill monitoring.

**Funding**

- #1 (Lamarche McG) indicated a contribution of $1.00 per tonne for use in a provincially controlled R & D facility.
- #34 (Notre) suggested that 1% of the processing or disposal tipping fees should go towards R & D for a minimum of $250,000 per year.
- #48 (Equity) expected funding to be provided by government, industry and larger organizations such as the UN, World Health Organization and CIDA: some form of fee on profits obtained from recovered materials as well as funds from contract research for public and private clients were identified as additional sources of funds.
- #50 (Alternative) will fund University programs.
- #79 (ORTECH) indicated $.50 to $1.50 per tonne would provide adequate funding for an R & D centre.



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### 7.2.2 Conceptual Ideas

Twelve respondents provided components or systems which provide conceptual or unproven designs. Many are addressed in the previous sections, some may warrant further consideration as research and demonstration projects.

- #7 (Cogenesis) and #48 (Equity) refer to the possibility of mining existing landfills to recover materials and increase site capacities.
- #20 (See-Bah) is discussed in detail in Section 4.2 and 6.2 and describes a thermal type of process which produces a reuseable aggregate.
- #22 (Nera) describes conceptually a component which digests waste to produce compost and methane gas: a 200 TPD facility is proposed as a demonstration plant by the respondent.
- #45 (Wastestreams) is discussed in detail in Section 5.4 regarding an MRF for construction and demolition waste, however, a component for stabilization of lightly contaminated "non-registerable" soil by cementation is also proposed. The MOE has been involved in several soil cementation projects and considers the technology feasible on a small scale.
- #46 (Agra) proposes the "ORFA" process of waste stabilization and is discussed in Section 5.4.
- #50 (Alternative Env.) proposes the Tezuka Kosan volume reduction system which is discussed in detail in Section 6.4.
- #66 (Pattison) involves a thermal process similar to #20 which produces an aggregate and is discussed in detail in Section 6.2.
- #71 (Env. Air Structures) proposes the use of air support structures to cover landfills, landfill operations and processing plants.
- #81 (Methon) offers the development of an artificial peninsula or island near shore in Lake Ontario within GTA for disposal of wastes. The system envisaged would consist of the emplacement of wastes in an engineered containment facility located in the lake with underdrains to collect leachate for treatment. The technology to be employed is known as a "hydraulic trap" whereby the leachate level in the facility is maintained below the surrounding groundwater level (lake level in this case) so that leachate movement is inward to the collection system.
- #82 (Chivers-Wilson) discusses the possibility of transporting waste by airplane and a



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procedure for air dropping the waste on open land in Northern Ontario. This is considered to be environmentally unacceptable and is an unacceptable option.

- #83 (Renutech Corp.) presents a composting concept, for Eastern Ontario and Western Quebec extended to include GTA wastes: referenced to Dade County, Florida and described in Section 5.5 for EOI #59 (Agripost).

**Summary**

Many respondents address the necessity for continuing research into unproven waste management solutions and conceptual ideas. The actual implementation of an R & D program(s) including a research centre, demonstration projects and institutional participation is largely dependent on the type location of the long term waste management system chosen by SWISC. Specific unproven and components and conceptual ideas should be examined on their merits relating to their application as a research or demonstration project within the long term system. Suggested funding for R & D ranges from one half to two percent of tipping fees for processing and/or disposal.



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## 7.3 FACILITY SITING

The location of facilities is a key feature in the development of the long-term waste management plan with respect to:

- the SWISC policy that facilities be located in a receptive community
- the requirements of the EAA that the facility locations be considered under reasonable alternatives to justify the selection of specific sites
- optimization with respect to the types of waste and integration within the overall system to ensure efficiency of operations and to minimize haul costs

This section of the report summarizes the locations which have been specifically identified and proposed for facilities in the EOIs and which are addressed in the evaluation of specific EOIs, to provide a basis for addressing the location of facilities in the RFP. The locations have been divided into those outside the GTA and those within the GTA by facility.

### 7.3.1 Outside G.T.A

**EOI #1 Lamarche McGuinty Inc.**

| | |
|---|---|
| Location of Facility: | Bristol, Quebec |
| Type of Facility: | MRF and Landfill |
| Distance from GTA: | 390 km |
| Regional Involvement: | - Town of Bristol Council approval (January, 1978)<br>- subsequent elected officials revoked original authorization<br>- status is now before the courts due to irregularities claimed in the methods employed, including zoning changes<br>- expect resolution by mid 1990 |
| Approval Status: | - Agreement in Principle from Quebec Ministry of the Environment (February 25, 1987)<br>- extensive documentation prepared |



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**EOI #12 Noel Richard Desautels and Paul Detering**

| | | |
|---|---|---|
| Location of Facility: | | Caledonia, Ontario |
| Type of Facility: | | MRF - Recycling of Drywall |
| Distance from GTA: | | 110 km |
| Regional Involvement: | - | community has not yet been approached |
| | - | expect no community concerns |
| Approval Status: | - | discussions with MOE for a Certificate of Approval are occurring |

**EOI #15 Expocrete Ltd.**

| | | |
|---|---|---|
| Location of Facility: | | Flamborough, Ontario |
| Type of Facility: | | MRF - Construction and Demolition |
| Distance from GTA: | | 75 km |
| Regional Involvement: | - | none to date |
| Approval Status: | - | conforms to zoning by-laws |
| | - | no other approvals obtained |

**EOI #16 Armbro Materials and Construction Ltd.**

| | | |
|---|---|---|
| Location of Facility: | | Marmora, Ontario |
| Type of Facility: | | Landfill |
| Distance from GTA: | | 200 km |
| Regional Involvement: | - | discussion with several interested parties in Marmora and surrounding areas |
| | - | Marmora Township Council opposes the project. |
| Approval Status: | - | only preliminary data available |

**EOI #20 See-Bah Waste Elimination Technologies Inc.**

| | |
|---|---|
| Location of Facility: | Sault Ste. Marie, Ontario |
| Type of Facility: | Disposal-pelletization |
| Distance from GTA: | 715 km |



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| | | |
|---|---|---|
| Regional Involvement: | - | Sault Ste. Marie has expressed an interest in this facility through its Economic Development Committee |
| | - | negotiations are occurring with Sault Ste. Marie regarding siting facility in Algoma Steel slag dump area |
| Approval Status: | - | no approvals attained to date |

**EOI #31 Reuter of Canada Inc.**

| | | |
|---|---|---|
| Location of Facility: | | Sarnia and Kettle Point, Ontario |
| Type of Facility: | | MRF and Composting |
| Distance from GTA: | | 290 and 280 km, respectively |
| Regional Involvement: | - | supported by Native North American Bands at both the Sarnia and Kettle Point reserves |
| Approval Status: | - | no approvals obtained to date |

**EOI #34 Notre Development Corporation**

| | | |
|---|---|---|
| Location of Facility: | | near Kirkland Lake, Ontario at Adam's Mine |
| Type of Facility: | | MRF and Landfill |
| Distance from GTA: | | 585 km |
| Regional Involvement: | - | endorsed by Town of Kirkland Lake and Town of Englehart |
| | - | local support and involvement in public consultation program |
| | - | requires Provincial approval |
| Approval Status: | - | only preliminary data available |
| | - | landfill is associated with EOI #53 (ONTC) |

**EOI #35 Enviromax Corporation**

| | | |
|---|---|---|
| Location of Facility: | | Town of Haldimand |
| Type of Facility: | | MRF, EFW, Landfill and waste wood products plant |
| Distance from GTA: | | 110 km |
| Regional Involvement: | - | application for a "minor exception" to a Haldimand-Norfolk zoning by-law |
| | - | opposition by local environmental groups and citizens |



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Approval Status: - preliminary investigations and public information for an E.A. have occurred

**EOI #43 Stinnes Enerco Inc.**

Location of Facility: Kapuskasing, Ontario
Type of Facility: Energy from Waste
Distance from GTA: 825 km
Regional Involvement: - EOI indicates "high level of support and community involvement for this project at this stage of development"
- Town of Kapuskasing Council has passed resolution to promote this project
Approval Status: - preliminary investigations only

**EOI #47 Nelson Aggregate Co.**

Location of Facility: Orillia Township, Simcoe County
Type of Facility: Landfill
Distance from GTA: 130 km
Regional Involvement: - none mentioned
Approval Status: - preliminary site investigations completed

**EOI #48 Equity Waste Management of Canada Corporation**

Location of Facility: Ignace or Kirkland Lake, Ontario
Type of Facility: MRF
Distance from GTA: 1680 and 585 km, respectively
Regional Involvement: - letter of support from the Council of the Township of Ignace and from the Town of Kirkland Lake and Town of Englehart (EOI #34)
Approval Status: - no approvals received as of yet



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**EOI #49 Steetley Quarry Products**

| | | |
|---|---|---|
| Location of Facility: | | Flamborough, Ontario |
| Type of Facility: | | Landfill |
| Distance from GTA: | | 75 km |
| Regional Involvement: | - | local opposition to landfill |
| Approval Status: | - | draft E.A. has been circulated to government and the public |
| | - | comments due by February 16, 1990 so that a final EA may be submitted for government review |

**EOI #53 Ontario Northlands Transportation Commission**

| | | |
|---|---|---|
| Location of Facility: | | near Kirkland Lake, Ontario |
| Type of Facility: | | MRF and Landfill |
| Distance from GTA: | | 585 km |
| Regional Involvement: | - | see EOI #34 |
| Approval Status: | - | see EOI #34 |
| | - | also other possible sites are being investigated between New Liskeard and Kirkland Lake adjacent to the ONR line |

**EOI #54 Ontario Northland Transportation Commission**

| | | |
|---|---|---|
| Location of Facility: | | Kirkland Lake/New Liskeard |
| Type of Facility: | | Landfill |
| Distance from GTA: | | 585/490 km |
| Regional Involvement: | - | see EOI #34 and #53 |
| Approval Status: | - | see EOI #34 and #53 |

**EOI #67 Laidlaw Waste Systems Ltd.**

| | | |
|---|---|---|
| Location of Facility: | | Watford, Ontario |
| | | Ottawa, Ontario |
| Type of Facility: | | Landfill |



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| | |
|---|---|
| Distance from GTA: | Watford - 245 km |
| | Ottawa - 395 km |
| Regional Involvement: | Watford, Warwick Township |
| | - landfill is presently operating in accordance with C of A |
| | - local opposition regarding expansion proposal |
| Approval Status: | Watford, Warwick, Township |
| | - an application for landfill expansion has been made under the EAA and EPA |
| | - reports have been submitted prepared |
| Regional Involvement: | Ottawa, Carlton Township |
| | - landfill is presently operating in accordance with C of A |
| Approval Status: | Ottawa, Carlton Township |
| | - future expansion potential claimed but not documented |

**EOI #73 Surety Environmental Inc.**

| | |
|---|---|
| Location of Facility: | St. John's, Newfoundland |
| Type of Facility: | EFW and Landfill |
| Distance from GTA: | 2230 km |
| Regional Involvement: | - provincial government encouragement claimed |
| Approval Status: | - negotiations ongoing regarding energy purchase agreements and site approvals for three maritime facilities |
| | - initial support is claimed from Toronto Harbour Commission representatives and St. Lawrence Seaway Authority |

**EOI #84 William Hutchinson**

| | |
|---|---|
| Location of Facility: | Laxton Township, Victoria County, Ontario |
| Type of Facility: | Landfill |
| Distance from GTA: | 135 km |
| Regional Involvement: | - local opposition and environmental concerns |
| Approval Status: | - no preliminary studies have been completed |



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### 7.3.2 Inside the GTA

**EOI #5 St. Lawrence Cement**

| | |
|---|---|
| Location of Facility: | - Lakeshore Road, Mississauga for processing RDF<br>- existing, non-specified, aggregate resource extraction operations for landfill |
| Type of Facility: | MRF and Landfill |
| Regional Involvement: | - support is being sought<br>- wishes for recognition of their intentions to pursue specific landfill project opportunities with the appropriate host Municipalities |
| Approval Status: | - EA completed (Executive Summary Draft EA document, included in EOI) for the opportunities to process waste into RDF and to recover materials<br>- landfill studies to be released in early 1990 |

**EOI #10 NSP Investments Limited**

| | |
|---|---|
| Location of Facility: | Region of Halton |
| Type of Facility: | Landfill |
| Regional Involvement: | - The position of the Region and its consultants was that the NSP site was the preferred site for landfilling in Halton in January 1987 |
| Approval Status: | - "the stated position of the MOE is that the site is acceptable for landfilling under the EPA"<br>- Joint Board Hearing in 1987 rejected as unacceptable from a hydrogeological standpoint<br>- Board's decision under judicial review scheduled for February, 1990<br>- all other areas addressed and accepted |

**EOI #17 Waste Distillation Inc.**
**Sussex Environmental**

| | |
|---|---|
| Location of Facility: | Seneca College or<br>Lester B. Pearson International Airport |



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| | | |
|---|---|---|
| Type of Facility: | | EFW |
| Regional Involvement: | - | under study by proponent, Metro Toronto, Seneca College and Ministry of Energy |
| | - | project proposed to Airlines Consultative Committee for a facility on the airport property now under federal jurisdiction |
| Approval Status: | - | implementation study presently being prepared partly funded by the Ministry of Energy |
| | - | project has been proposed |
| | - | not yet undergone the full approval process to construct and operate in GTA |

**EOI #27 Airtite Environmental Industries Inc.**

| | | |
|---|---|---|
| Location of Facility: | | CNR Macmillan yard in the Town of Vaughan identified as potential site |
| Type of Facility: | | Composting |
| Regional Involvement: | - | not pursued at time of EOI submission |
| Approval Status: | - | not pursued at time of EOI submission |
| | - | anticipate a simple process as land is zoned industrial and propose a facility less than 200 TPD |

**EOI #28 Superior Crawford Sand & Gravel Ltd.**

| | | |
|---|---|---|
| Location of Facility: | | 192 hectares landfill zoned industrial immediately adjacent to Keele Valley landfill |
| Type of Facility: | | provision of lands expansion of Keele Valley landfill siting of MRF's |
| Regional Involvement: | - | not pursued at the time of EOI submission |
| Approval Status: | - | have a preliminary engineering report |

**EOI #56 Chasson Pallets**

| | |
|---|---|
| Location of Facility: | Port Perry, Ontario |
| Type of Facility: | Wood waste recovery/recycling |



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Regional Involvement: - currently operating acceptably
Approval Status: - none needed-area zoned industrial

**EOI #67 Laidlaw Waste Systems Ltd.**

Location of Facility:
- MRF and composting at existing landfill sites and transfer stations
- landfill to be located at existing landfill in Newcastle

Type of Facility:
1. MRF
2. Composting
3. Landfill

Regional Involvement:
- not pursued at the time EOI was submitted for MRF and compost
- opposition to the proposed landfill expansion expressed by constituents and the Town of Newcastle

Approval Status:
- cannot begin until SWISC selects strategies and options
- EA documents for expansion of the existing landfill have been prepared and are available

**EOI #69 MSW Recycling**

Location of Facility: Within 150 km radius of the GTA
- Transfer stations
  1. Milton
  2. Woodbridge (south end)
  3. Ashburn

Type of Facility: composting plant
transfer stations

Regional Involvement: - not pursued at time of EOI submission

Approval Status:
- not sought at time of EOI submission
- each location would conform to all local regional and provincial criteria and regulations
- demonstration facility being studied



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**EOI #72 Markham/Miller**

| | | |
|---|---|---|
| Location of Facility: | | processing to be located at existing transfer facilities in the Regions of York and Durham |
| | - | 500 acres in Durham Region for landfill |
| Type of Facility: | | Processing, Transfer Stations and Landfill |
| Regional Involvement: | - | landfill not pursued at time EOI was submitted |
| Approval Status: | - | processing facility presently zoned M3 all municipal and provincial regulations and standards would be addressed |
| | - | landfill approvals not pursued at time EOI was submitted |

**EOI #73 Surety Environmental**

| | | |
|---|---|---|
| Location of Facility: | | Port area of Toronto |
| Type of Facility: | | Processing/Transfer station |
| Regional Involvement: | - | respondent claims discussions with Toronto Harbour Commission suggests lands are available |
| Approval Status: | - | not pursued in reference to transfer facility at the time of EOI submission |

**EOI #77 Montenay/Atlantic**

| | | |
|---|---|---|
| Location of Facility: | | Lake Ontario Steel Co. site in Whitby, Ontario |
| Type of Facility: | | Processing and EFW |
| Regional Involvement: | - | meetings have been held with Durham Regional representatives |
| Approval Status: | - | enabling legislation is currently in place for this component to be implemented |

### 7.3.3 General

In many EOIs, facilities were proposed to be located at existing landfill sites, transfer stations or industrial lands owned by the Regions. The Regions have indicated that, in fact, little space is available at existing facilities and alternative sites will have to be identified by the Respondents or the Regions.



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**Summary**

Only the facilities proposed by EOIs #31, #34, #43, #53 and #48 appear to have a receptive community at this time as listed below.

Receptive Communities:

1. #31 (Reuter) for MRF at Sarnia and Kettle Point, Ont.
2. #34 (Notre) and #53 (ONTC) for a MRF and Landfill at Adams Mine near Kirkland Lake, Ont.
3. #43 (Stinnes) for an EFW facility near Kapuskasing, Ont.
4. #48 (Equity) for an MRF near Ignace, Ont. (also references Kirkland Lake for MRF and Landfill).

This issue must be addressed specifically by Proponents in their responses to the RFPs.



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## 7.4 OWNERSHIP AND OPERATION

In order that SWISC may select an appropriate structure to manage the solid waste system in the GTA, the REOI requested that respondents state whether they were willing to submit a Proposal and subsequently contract with the Authority to provide the facilities described in their response with respect to each of four options.

| | | |
|---|---|---|
| **Option 1** | - | Full Ownership and Responsibility for operation of the Waste Management System by the Authority |
| **Option 2** | - | Shared Ownership and Responsibility for operation of the Waste Management System by the Contractor and Authority |
| **Option 3** | - | Authority to lease (with Option to Purchase) the Proposed System from the Contractor |
| **Option 4** | - | Full Ownership and Responsibility for Operation of the Waste Management System by the Contractor |

Most of the respondents indicated flexibility with respect to the options with the following exceptions:

- Option 1 Only
  - EOI #13 (Dynaforce) and EOI #46 (Agra)
- Option 4 Only
  - EOI #32 (Recomp); EOI #37 (Wood Waste); EOI #49 (Steetley); EOI #66 (Pattison); EOI #74 (Bedminster)
- Option 4 and Option 1
  - EOI #70 (Frank Fattah)
- Option 4 Preferred and Option 2
  - EOI #7 (Co-genesis); EOI #20 (See-Bah); #EOI #43 (Stinnes); EOI #62 (CP Rail)
- Option 4 and Option 3
  - EOI #68 (ICG); EOI #69 (MSW Recycle)



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- All Options Except for Control of Transportation Component
  - EOI #61 (CN/Bechtel)

**Summary**

**SWISC will consider the options further with respect to development of its management structure before issuance of RFPs.**

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## 7.5 CONSULTING SERVICES

It should be emphasized that the REOI was not intended as a request for engineering and other consulting services to SWISC or SWISC member Regions. Engineering and consulting firms who did not submit and EOI will by no means be excluded from future consideration for the provision of services to SWISC or SWISC member Regions.

Table 7.5 represents a summary of consulting service EOIs. These particular EOIs did not proposed the utilization of a specific system or components, or introduce new methods and technologies. Rather they offer individual consulting services skills, project management capabilities and some project financing.

As a consequence, a series of individual criteria were established to adequately represent these EOIs and suggest at what project stage they could be evaluated on their own merit.



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**Table 7.5**
**SUMMARY OF CONSULTING SERVICES**

| EOI<br>Criteria | EOI # 8<br>Lavalin Engineers | EOI # 14<br>MacLaren Engineers |
|---|---|---|
| 1. General Project Management, Engineering, Design, Procurement, Construction | Project management through MacLaren Engineering | Project management in consortium with Lavalin Divisions to handle components |
| 2. Financial Planning, Management, Financial Assistance | . 18 - 25 year financing<br>. Formation of bank syndicate | . 18-25 year financing through Lavalin<br>. Formation of syndicate with banks/institutions |
| 3. Feasibility Analysis | No details | No details |
| 4. Environmental Impact Assessment | Provided by MacLaren Plansearch | No details |
| 5. Engineering Assessment | Large engineering company with expertise in design of solid waste transfer stations. EFW plants and hydroelectric facilities. | Design and implementation of waste recycling and recovery programmes |
| 6. Landfill Design and Construction | Provide strategy and operating procedures | No details |
| 7. Site Management | Experienced | No apparent experience |
| 8. Special Expertise | Varied through utilization of divisions and consortium members | Recycling system design |
| 9. Summary | Parent company of MacLaren Engineering with broader scope of services | Wholly owned subsidiary of Lavalin Engineering. Aim to provide resource management for Lavalin Divisions |
| 10. Stage of Possible Project Entry | If considered possibly stage 5 | If considered possibly stage 5 |

Table 7.5
SUMMARY OF CONSULTING SERVICES

| EOI<br><br>Criteria | EOI # 23<br>The Swedish Trade Council | EOI # 39<br>SNC Inc. |
|---|---|---|
| 1. General Project Management, Engineering, Design, Procurement, Construction | No details | Greatest strength in general management |
| 2. Financial Planning, Management, Financial Assistance | ? | Able to organize financing |
| 3. Feasibility Analysis | ? | Experienced |
| 4. Environmental Impact Assessment | ? | Experienced |
| 5. Engineering Assessment | No details | Strength |
| 6. Landfill Design and Construction | ? | Limited |
| 7. Site Management | ? | No details |
| 8. Special Expertise | Primarily consulting engineering companies and manufacturers of plastic containers for separation | Engineering, project construction management |
| 9. Summary | EOI no applicable. Lists various Swedish companies that would have project interest | Interest in project management of consortium of contractors and in financing |
| 10. Stage of Possible Project Entry | If considered possibly stage 5 | If considered possibly stage 5 |

Table 7.5
SUMMARY OF CONSULTING SERVICES

| EOI<br><br>Criteria | EOI # 42<br>Browning-Ferris Industries Ltd. (BFI) | EOI # 57<br>Trow, Dames & Moore |
|---|---|---|
| 1. General Project Management, Engineering, Design, Procurement, Construction | Project management in collection, reduction, treatment and disposal of waste | Management and design of environmental engineering, particularly soil and fill debris |
| 2. Financial Planning, Management, Financial Assistance | No details | No details |
| 3. Feasibility Analysis | No details | Experience related to site remediation management, hydrogeology and geotechnology |
| 4. Environmental Impact Assessment | No apparent experience | Soil, fill and construction/ demolition materials |
| 5. Engineering Assessment | Strength in site evaluations | Strength in hydrogeology and geotechnology |
| 6. Landfill Design and Construction | Strength in landfill operations and management | No details |
| 7. Site Management | Strength | Experience in site management for redevelopment projects |
| 8. Special Expertise | Operationalization of recycling treatment and disposal of waste | Diversion system for soils and demolition debris |
| 9. Summary | BFI and subsidiaries collect, transport, treat and dispose soild waste and industrial hazardous wastes. | Environment engineering with focus on hydrogeology and site remediation management |
| 10. Stage of Possible Project Entry | If considered possibly stage 5 | If considered possibly stage 5 |

Table 7.5
SUMMARY OF CONSULTING SERVICES

| EOI | EOI # 85<br>Stone & Webster Canada Limited<br>(BFI) |
|---|---|
| **Criteria** | |
| 1. General Project Management, Engineering, Design, Procurement, Construction | Strength in program design and evaluation |
| 2. Financial Planning, Management, Financial Assistance | Assess financial considerations and economic impact |
| 3. Feasibility Analysis | Evaluation of process technologies |
| 4. Environmental Impact Assessment | General |
| 5. Engineering Assessment | Broad range |
| 6. Landfill Design and Construction | No apparent experience |
| 7. Site Management | No apparent experience |
| 8. Special Expertise | Economic and technical feasibility studies |
| 9. Summary | Focus in construction and project management, particularly regarding program design, feasibility and economic impact |
| 10. Stage of Possible Project Entry | If considered possibly stage 5 |

# 8.0 ADDITIONAL DATA FROM REGIONS' WASTE MANAGEMENT PLANNING

## 8.1 INTRODUCTION

This section contains a summary of the information currently available from each Region's waste management planning, with the intent of identifying any components or technologies for waste management which are not included in the EOIs received. The Regions are continuing to develop their own plans for waste management in parallel with the SWISC initiative to provide a basis for comparison with the system recommended by SWISC and, as an aid to decisions relating to their long-term commitment.

## 8.2 THE REGIONAL MUNICIPALITY OF DURHAM

Two documents are referenced as a basis for this synopsis, namely:

(a) "Waste Management Study-Update Report" for the Regional Municipality of Durham, by MacLaren Engineers, dated July 1988.
(b) "Summary Report: Durham Regional Waste Reduction and Recycling Programs" by Elaine Collis and Sherry Eaton, dated October 1989.

The strategy recommended in the Waste Management Study consisted of:

1. Expansion of the Region's efforts to develop and implement waste reduction, recycling and re-use programs to reduce landfill requirements as a first priority.

   A diversion target was developed of 25% of the existing residential and industrial/commercial waste streams by 1992. The recommended program components were divided into two groups: those related to the expansion and refinement of the existing (Blue Box based) system and those more related to "beyond curbside".

   It was recognized that increased diversion might be obtained in the future as the result of "market forces and the appearance of new technologies, which are not fully known at this time".



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2. The provision of EFW facilities for those incinerable wastes remaining after the diversion programs. A Design Feasibility Report was recommended to examine this component further consistent with the requirements of the EAA.

3. Continued involvement with Metro in the SWEAP process to determine the optimum provision of landfill capacity for the remaining wastes and ash from the EFW facility.

The subsequent summary report on the Reduction and Recycling Programs describes Durham's adoption of an aggressive waste reduction, re-use and recycling program in 1988 and outlines the programs implemented and planned to achieve an ultimate goal of 25% reduction in wastes to landfill by 1992 and 50% by the year 2000.

**Summary**

The technologies considered in these reports are included in the EOIs submitted.

## 8.3 THE REGIONAL MUNICIPALITY OF HALTON

The following documents are referenced as a basis for this synopsis, namely:

(a) "Phase 1 - Evaluation of Alternatives for Waste Management and Energy from Waste - Final Report" for the Regional Municipality of Halton by MacLaren Engineers, dated November 1989.
(b) The report to the Chairman and Members of the Planning and Public Works Committee from R.W.J. Moore, P.Eng., Commissioner of Public Works, dated 22 January 1990 on item (a).
(c) "Wet/Dry Recycling in Halton Region - a Feasibility Study - Final Report", by R. Cave and Associates Ltd., dated January 1990.
(d) The report to the Chairman and Members of the Planning and Public Works Committee, from R.W.J. Moore, P.Eng., Commissioner of Public Works, dated 17 January 1990 on item (c).



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At the present time, the region is recycling 22% of household waste through its Blue Box program, plus approximately 15% of other wastes for a total diversion of approximately 18% from disposal. The remainder of the wastes are exported to the Occidental Chemical incinerator in New York State; to the Walker Brothers landfill site in Niagara Region; and to the Steetley landfill in the Region of Hamilton-Wentworth. (Steetley's landfill is currently closed.)

The Phase 1 (reference (a)) report was carried out to meet the requirement of the Conditions of Approval for the Region's new landfill site under the Environmental Assessment Act that 50% of the waste remaining after recycling be diverted from the landfill site by the end of the eighth year of operation. This report summarized previous studies done and reviewed alternative technologies and options available to the Region. The report identified enhanced recycling and source-separated composting (mixed waste composting was rejected) as alternatives to reduce the amount of waste requiring landfill and to meet Halton's waste diversion commitment. The remaining components recommended for further consideration included participation in the St. Lawrence Cement RDF coal replacement project in Mississauga and EFW plants to serve Halton only, or to serve Halton and other municipalities (such as a SWISC-sponsored project). The further examination of these options, in accordance with EAA requirements, would be carried out subject to the results of the Greater Toronto Area initiative on waste management and the St. Lawrence Cement RDF coal replacement project.

The size of these EFW options would be subject to the results of the Region's initiatives to meet the target of 50% diversion of wastes. A key component in these initiatives is the implementation of the Wet/Dry Pilot Program Feasibility Study. This pilot program has been recommended because, prior to making a decision on more advanced 3Rs systems, Halton wants to evaluate the collection methodology, processing and market suitability of materials generated by a Wet/Dry recycling system. The Commissioner of Works estimated that the pilot program would not be implemented prior to 1991. Halton has also initiated a pilot Igloo European-style container program in areas where the Blue Box program has not been implemented.

## Summary

The technologies considered in these reports are included in the EOIs submitted. The pilot program on Wet/Dry is particularly important to considering this alternative in the SWISC long-term waste management system.



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## 8.4 THE MUNICIPALITY OF METROPOLITAN TORONTO

This synopsis is based on the document, "SWEAP - Component No. 7: Master Plan", Discussion Paper No. 7.1 entitled "Towards a Solid Waste Management Master Plan" by the Proctor & Redfern Group and dated January 1990. This report consolidates and summarizes information prepared by Metro and its consultants, including "Paper 3.1 - Introduction to Solid Waste Management Approaches, December 1987" and "Paper 3.2 - Long-Term Planning Analysis of Solid Waste Management System Options, December 1988".

The draft waste management policies in the above reports describe how the development of alternative systems should have full regard for the following approaches, listed in their order of priority:

No. 1 - Reduce the quantity of material becoming solid waste
No. 2 - Reuse material for the same purpose
No. 3 - Recycle, including material recovery
No. 4 - Compost
No. 5 - Incinerate with energy recovery/landfill (residues of the above approaches)

Three alternative waste management systems are presented for discussion purposes involving various diversion alternatives and disposal by landfill only or landfill and energy from waste. These are predicated on the establishment of solid waste management systems (in the relatively short 20-year period) which recognize and consider the longer-term objectives, including emphasis on waste reduction and an eventual elimination of incineration and landfill.

A recommendation has not been made regarding the priority of approaches for landfill and incineration. However, research and development is recommended with respect to the various waste management options, including specifically:

- a 190 TPD prototype compost facility
- a 190 TPD prototype dry waste sorting plant to be constructed by 1991
- a pilot wet collection program



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These are designed to permit the development of a standard approach for the design and operation of subsequent plants and for market development at a scale appropriate to Metro.

**Summary**

The technologies considered in these reports are included in the EOIs submitted. The intent of the Discussion Paper No. 71 to check the viability of technologies prior to full-scale implementation at a Metro scale is relevant to consideration of these technologies for SWISC.

## 8.5 THE REGIONAL MUNICIPALITY OF PEEL

Reference has been made to the "Waste Management Master Plan Update for the Regional Municipality of Peel, Stage 3, Final Report" by MacLaren Plansearch, dated August 1988.

This report was the result of work initiated in 1982 and regularly updated, which considered all available technologies and components for a waste management system. The report recommended three key components, namely:

- an aggressive set of waste reduction and recycling programs (3Rs) based on the further development of the Region's Blue Box and other programs to achieve 30% diversion of population-related wastes by 2001 and 21% diversion of employment-related wastes by 2001, for a total diversion of 25% by 2001.

For planning purposes, it was assumed that this level would be maintained over the remainder of the 40-year planning period for a 40-year overall diversion of 23%. If the diversion could be improved through developing programs, then less capacity would be required and/or longer lifespan would result for the other components:

- the development of EFW facilities to dispose of 32% of all wastes generated over the 40 year planning period.
- the development of landfill facilities to dispose of 45% of all waste, including EFW ash, over the 40 year planning period.



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Council was concerned that a commitment must be made to a greater 3Rs target and has not adopted the report. The Region is participating in a 400 TPD private sector EFW facility which has received EAA approval and is considering the St. Lawrence Cement EFW initiative. Besides the additional efforts recommended in the 1988 report for the 3Rs, the Region is investigating additional technologies which would allow an increase in the 3Rs or diversion targets.

**Summary**

The technologies considered are included in the EOIs, with the exception of the hydropulping process developed by Black-Clawson, under the trade name Hydrosposal.

## 8.6 THE REGIONAL MUNICIPALITY OF YORK

This synopsis is based on the document "Waste Management Study, Report to the Regional Municipality of York" by MacLaren Engineers, dated May 1989, and on Report No. 18 of the Regional Engineering Committee to Council, dated October 1989.

The Region has adopted the objectives of achieving minimum overall 25% reduction/recycling of waste by 1995 and minimum overall 50% reduction/recycling of waste by 2011. Key components are identified for each waste stream and include the central composting of "pure stream" organics, dry sorting operations, market development, etc.

The Region is proposing to construct a Recycled Materials Processing Facility with a projected start-up date in early 1991.

For the management of wastes remaining after 3Rs activities, it is recommended that York continue to cooperate with neighbouring Regions in identifying solutions, including the SWISC initiative, monitoring of SWEAP and participation on SWEAP committees etc. In the event that GTA proposals are not fully satisfactory for the management of wastes generated in York Region, it was also recommended that the Region consider the implementation of a Master Plan by the Spring of 1990 at the latest.



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## Summary

The technologies considered in this report are included in the EOIs submitted.

As additional programs are developed in the cause of the Regions' and Metropolitan Toronto's planning processes, the information should be co-ordinated with SWISC's strategies.

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## 9.0 POTENTIAL SYSTEM COMPONENTS

This section assembles the information from the preceding sections to evaluate how the acceptable components may be utilized to meet SWISC's principles for a long-term waste management system.

This represents Step C.4 in the evaluation procedure described in Section 2. The preceding steps were carried out in Sections 5, 6 and 7 namely;

- Step C.1 to check EOI compliance with the proven criterion. As noted, this step resulted in the decision to carry forward EOIs which did not completely meet this criterion but were considered to have potential to do so.

- Step C.2 to check EOI compliance with the three important factors, and

- Step C.3 to check EOI suitability with respect to the total environment criteria.

Through lack of detail in the EOIs, Steps C.2 and C.3 were finally addressed in terms of the component in a generic manner rather than for each EOI.

### 9.1 REGIONS' WASTE MANAGEMENT PLANNING

The review of the Regions' and Metro's waste management planning in Section 8 concluded that all technologies and components have been considered in the evaluation of the EOIs. The existing plans are concentrating on ways to reach at least the 25% diversion of wastes by 1992 and establish a basis for achieving 50% diversion by 2000. Considerable momentum has been established with respect to grass roots participation in many activities based on the blue box.

Many of the ideas presented in the EOIs are already being implemented to improve the effectiveness of existing diversion programs, and demonstration projects are planned to test the suitability of alternatives or extensions to the existing systems. Early implementation of these plans will be essential to meet the diversion targets.



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Appropriate alternatives to the traditional disposal methods of landfill and EFW (including RDF) have not been identified at this time. The extent of their use will be reduced by increased diversion (including reduction), but it appears that they will still constitute a major consideration in the waste management systems over the next 15 to 20 years.

## 9.2 POTENTIAL COMPONENTS

The analysis in Section 5, 6 and 7 of potential components for a system, has identified the key elements to meet SWISC's principles and they are summarized in this section.

### 9.2.1 Diversion Components

The objective of the long-term waste management system is to achieve 50% diversion of wastes by the year 2000. This has not been accomplished elsewhere on the scale applicable to SWISC. It is therefore necessary to consider a variety of processes which, although not proven at the commercial scale of the GTA, appear to have the potential to meet the diversion criterion.

The components which qualify to help achieve this objective are the 3Rs, Reduction, Re-use and Recycling (including recovery of materials). As noted previously, recovery of energy from mass burning or the production and use of RDF are not included in diversion.

A condition of qualification is that materials from diversion are marketed and recovered as a resource. This has led to serious consideration of technologies such as pyrolysis, which have initially been placed in the category of a disposal component, but which claim that a marketable char could be produced, thus qualifying as a diversion component. These processes would be the subject of additional R&D and if found appropriate for the GTA would be used to replace proven disposal methods and help achieve, or increase diversion beyond, the 50% target.

#### 3Rs Action Plan

All ideas with respect to the 3Rs presented in the EOIs, as well as those EOIs which propose specific actions which could assist the 3Rs in the short-term, were extracted from the EOIs. Both groups are described in Section 5.3.1 and were submitted to the 3Rs task force. The findings of the 3Rs Action Plan are considered in this report as they will have a significant impact on the long-term system selection.



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**Reduction of Wastes**

Reduction is generally accepted in the GTA and by SWISC resolution as the priority component of the 3Rs. As discussed in Section 5.2, success in maximizing reduction of wastes requires concerted efforts by all levels of Government, the Private sector and the Public.

Recent estimates of per capita waste generation rates show that net reduction is not yet occurring and considerable effort is required before the various techniques being tried and investigated can be considered proven. The net environmental effects of reducing waste generation are considerable and the community is receptive to this priority component. However the percentage of the total waste stream which can actually be reduced and when this will occur, has not been determined as yet. The results of the Federal packaging investigations, the further effects of the ideas for reduction summarized from the EOIs, and the results of the 3Rs action plan are critical to establishing what can be achieved.

Reduction will be taken as a common components of any waste management system.

**Re-Use of Material**

Re-Use is generally accepted in the GTA as the second priority component in the 3Rs. Ideas from the EOIs were fed to the 3Rs Action Plan which presents a series of recommendations to improve the effectiveness of this aspect of diversion. The actions taken will assist in establishing the percentage of diversion which can be achieved.

Re-Use of material will be taken as a common component of any waste management system.

**Recycling**

Recycling involves a broad range of systems and processes for diverting materials from disposal. From the analysis in Sections 5.3 to 5.5 the EOIs proposed two basic approaches which claimed to exceed the 50% diversion target, namely:

1. • Enhanced Blue Box for the collection of separated materials from Residential wastes utilizing a three bin system.



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- One bin (Blue Box) would contain separated recyclables for pick-up and processing of the separated materials. An alternative, where the number of separated materials would exceed the capacity of the collection system to maintain the materials in separated form, is to allow commingling of some or all of the materials, followed by processing of the commingled materials.
- One bin would contain separated organics for composting.
- One bin would contain the remaining materials.

- A MRF would be used to recover additional materials
- Separate collection and composting of yard wastes.
- Separation at source of recyclable materials from Commercial/Industrial wastes and MRF facilities to recover additional materials from the remainder
- Diversion of Construction/Demolition wastes

2.
- Use of a two bin collection system (wet/dry) for materials separated at source from the Residential, Commercial and Industrial sectors.
  - One bin would contain all wet materials.
  - One bin would contain all dry materials.
- A MRF would be used to recover recyclable materials.
- Separate collection and composting of yard wastes.
- Collection and processing of Construction and Demolition wastes.

The advantages and disadvantages of these diversion alternatives are presented in the report. In fact, a combination of the two basic approaches may prove to be most desirable. Mainly large scale MRFs and composting facilities were proposed to meet the needs of the GTA. From checks made on the existing facilities provided as reference, it was considered that these facilities were not proven at the scales proposed with respect to GTA conditions and markets. However there are enough promising processes as discussed in Section 5, to warrant an aggressive approach to determining what is most appropriate and at what scale to achieve the 50% diversion target. Additional information is required on waste composition and methods of measuring the achievements of the various diversion alternatives.

In summary, priority should be given to establishing the amount of diversion which various methods can achieve by reduction, re-use and recycling of materials from the separate waste streams. This includes the evaluation of the large scale MRFs proposed in the EOIs for



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processing MSW in the GTA. This will form the basis for selecting the preferred methods and their scale throughout the GTA.

### 9.2.2 Disposal Components

The only disposal alternatives which meet the Proven criteria at this time are EFW (including RDF) and Landfill. Further research is required to prove other methods such as Pyrolysis, Volume Reduction, Wet Oxidation and advances based on thermal processes which may produce inert or reusable products.

In the analysis of the disposal components in the EOIs as described in Section 6, the production of energy from waste was considered in two forms, namely:

- Refuse Derived Fuel (RDF) which is the combustible fraction of the waste produced from mechanized resource recovery plants and suitable for combustion in dedicated incinerators or used as a supplementary fuel in industrial boilers, kilns, etc. The MRF facilities whose main function is materials recovery and which produce RDF only as a supplement, would be considered after they had been sufficiently proven.
- Energy from Waste (EFW) which is the mass burning of MSW, generally with some limited material preparation, to produce steam and/or electricity.

Both of these components are considered proven technologies, for the production of energy from wastes.

Landfilling is the other proven technology and at this time, represents a common component for any waste management system.

Combinations of energy from waste and/or landfilling will be considered to determine the optimum disposal facilities for the GTA. These facilities would be designed to take 50% of the GTA wastes after the year 2000, with flexibility to accommodate less material over a longer period of time should the 50% diversion target be exceeded.



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### 9.2.3 Other Components

The preceding components have been identified as key components for the development of the long-term waste management system. The other components discussed in Section 7 are of course necessary for a total system but are dependent in detail on the resolution of the particular technologies chosen from the key components; their locations; size; and method of operation.

These other components addressed in Section 7, are summarized herein to assist in the consideration of the alternative systems which are discussed in Section 10.

**Transportation (Section 7.1)** - The EOIs contained alternatives for transportation by road, rail and water and combinations of these. Road transportation has been the traditional means of haulage in the GTA and would continue to play a role in any system. The rail transportation alternative is critical for haulage to remote sites and has been developed in recent years in North America. On the basis of available information, rail transportation is considered to be a viable haulage alternative.

Shipping of wastes by water from the GTA is restricted by winter shut down of the Seaway. As storage of wastes for a three month period would be impractical, winter haulage by other means would be necessary. Additional information is required to address the technical aspects of waste transport by ship before this alternative could be considered a practical alternative.

**Research & Development (Section 7.2)** - Those EOIs which contained ideas for waste management which had not been considered historically as practical components were analyzed to reject those which were unsuitable. The remainder were reclassified to the most appropriate technology and evaluated therein: this resulted in recommendations for inclusion in R and D or rejection.

**Facility Siting (Section 7.3)** This section summarized the information provided in the EOIs on the potential sites available for components of the system. It emphasized the need to define sites available within the GTA for diversion facilities. Respondents generally indicated that they would locate at existing or old landfill sites, transfer stations and/or industrial lands. Available space at landfill sites and transfer stations is apparently limited: suitable lands would have to be identified by the respective Regions or through RFPs for particular facilities.



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Only two disposal sites and two processing facility sites identified the potential for a receptive community. Unless this criteria was met at the RFP stage for more sites, the EA Board might not be satisfied with the site selection process based only on this receptive community approach.

**Ownership and Operation (Section 7.4)** - All EOIs were summarized with respect to the responses to the question of four options for ownership and operation of their facilities. These responses would be considered by SWISC relative to the development of a management structure for the long-term waste management system. Based on the preferred management structure, the RFPs would stipulate the options which are acceptable to SWISC.

**Consulting Services (Section 7.5)** - Those EOIs which basically offered consulting engineering, management services and/or assistance in financing rather than specific facilities have been received by SWISC for further consideration as the long-term management system is developed.

**Summary**

The following critical components will be considered further in the development of potential systems for the GTA. Within these alternatives the number and location of various facilities must be evaluated to produce an optimum system.

- Diversion
  - Reduction and Re-Use of wastes (Section 5.2)
  - Recycling through the activities identified in the 3Rs action plan and either a three bin or two bin source separation system. These include the separate treatment of the various waste streams and further consideration of the MRF and composting facilities identified in Sections 5.4 and 5.5 as the most promising, to achieve the diversion targets.

- Disposal
  - EFW (including RDF) and/or landfilling for these materials remaining after diversion.



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- Other Components
  - These components (such as transportation, etc.) are considered complementary to the key diversion and disposal components. Their role will be determined by the strategy accepted by SWISC from the analysis in Section 10.



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## 10.0 EVALUATION FINDINGS

This section presents SWISC's basic options for proceeding with the next stage in the development of the long-term waste management system.

### 10.1 SYSTEMS SUBMITTED IN THE EOIs

**Complete Systems**

Six EOIs of the 16 EOI system responses received, appeared to offer all of the components identified in the REOI. This included the initial supplementation of the existing area municipalities diversion programs to the final disposal of the remaining waste, all of which are necessary to provide a complete long-term waste management system.

These EOIs included: #48 - Equity Waste Management
#50 - Alternative Environment
#51 - WMI Waste Management of Canada/Wheelabrator Evaluation
#53 - Ontario Northland Transportation Commission
#67 - Laidlaw Waste System
#73 - Surety Environmental Inc.

These six were subjected to the S1 (50% diversion) and S2 (proven success) screening process described earlier.

#50 - Alternative Environment, and #73 - Surety Environmental, did not satisfy the 50% diversion criteria and were therefore referred for further consideration in the component evaluation screening.

The remaining systems were then subjected to a more detailed evaluation of their components. The quality of these EOIs demonstrated that there is the capability to handle large portions of the waste stream and respond to EA requirements. Key components including transportation, EFW and landfill were identified which may meet the GTA requirements. However, it was found that each EOI contained components, particularly with respect to achieving the 50% diversion target,



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which require additional information and analysis. These components should be subjected to additional testing before SWISC could proceed to the RFP stage in anticipation that they would provide an acceptable system.

In the final analysis it was concluded that complete systems should not form the basis for RFPs, but that the components of these EOIs be recommended for further screening in the RFP stage.

**Partial Systems**

Ten EOIs proposed significant portions of a complete system. To determine if these partial systems might provide a significant portion of a complete system they were described and evaluated in the S.1 screening process.

Three of the EOIs provided insufficient information and are not evaluated further at this time:

#20 See-Bah
#35 Enviromax
#65(a) Otto-Canada

The remaining seven EOIs provided varying portions of a complete system and were referred to the component evaluation process:

#4 Dynavest International
#7 Cogenesis Corp.
#9 Foster Wheeler
#31 Reuter of Canada Inc.
#42 Browning Ferris Industries
#66 Pattison Information Inc.
#72 Markham Disposal

## 10.2 OUR ANALYSIS INDICATES SEVERAL POTENTIAL METHODS TO ACHIEVE 50% DIVERSION

The 3Rs hierarchy adopted by SWISC for wastes diversion is: (1) Reduction, (2) Re-use, and (3) Recycling including recovery of materials and compost. The production of RDF and EFW are not included in the diversion goal of 50% by the year 2000.

Reduction requires concerted efforts by all levels of Government, the Private Sector and the Public. It is common to all systems and is to be maximized. However, the actual percentage of diversion which can be achieved by reduction is unknown at this time.



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Separate collection and disposal of Household Hazardous Wastes (HHW) is also common to all approaches and is essential for an environmentally acceptable waste management system. Again, the percentage of diversion which can be achieved is unknown.

The 3Rs Action Plan recommends approaches which build on existing efforts to increase diversion as soon as possible. These actions will establish a basis for the percentage diversion which can be achieved and the need for additional or preferred measures.

The EOIs proposed two basic approaches which claimed to exceed the 50% diversion target, namely:

(1)
- Enhanced Blue Box for collection of source separated materials in a three container system. One container (Blue Box) would contain separated recyclables for pickup and processing. One container would contain separated organics for composting. One container would contain the remaining wastes. A MRF would be used to recover additional materials from this third waste stream.
- Separate collection and composting of yard wastes.
- Separation at source of recyclable materials from Commercial/Industrial wastes and MRF facilities to recover additional materials from the remainder.
- Diversion of Construction/Demolition Wastes.

(2)
- Use of a two bin collection system (wet/dry) for materials separated at source into wet wastes and dry materials. These would be processed by MRF.
- Separate collection and composting of yard wastes.
- Collection and processing of Construction and Demolition wastes.

The advantages and disadvantages of these diversion alternatives are presented in Section 5.3.2. Mainly large scale (i.e. in excess of 800 TPD) MRFs and composting facilities were proposed to meet the needs of the GTA. From checks made on the existing facilities provided as reference, it was considered that these facilities were not proven at the scales proposed with respect to GTA conditions and markets. However, there are enough promising processes, as discussed in Section 5, to warrant an aggressive approach to determining what is most appropriate and at what scale to achieve the 50% diversion target.



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In summary, priority should be given to establishing the amount of diversion which various methods can achieve by reduction, re-use and recycling of materials from the separate waste streams. This includes the evaluation of the large scale MRFs proposed in the EOIs for processing MSW in the GTA and consideration of a larger number of smaller facilities. This will form the basis for selecting the preferred methods and the scale most appropriate to serve the respective members of SWISC.

## 10.3 OUR ANALYSIS PROPOSES ENERGY FROM WASTE AND/OR LANDFILL FOR DISPOSAL

In the analysis of the disposal components in the EOIs as summarized in Section 6, the production of energy from waste was considered in two forms, namely:

- Refuse-Derived Fuel (RDF) which is the combustible fraction of the waste produced from mechanized resource recovery plants and suitable for combustion in dedicated incinerators or used as a supplementary fuel in industrial boilers, kilns, etc. The MRF facilities whose main function is materials recovery and which produce RDF only as a supplement, would be considered after they had been sufficiently proven. However, plants designed primarily for production of RDF would be considered proven now for disposal of wastes.
- Energy from Waste (EFW) which is the mass burning of MSW, generally with some limited material preparation to product steam and/or electricity.

Both of these components are considered proven technologies, for the production of energy from wastes.

Landfilling is the other proven technology and at this time, represents a common component for any waste management system.

Combinations of energy from waste and/or landfilling will be considered to determine the optimum disposal facilities for GTA. These facilities would be designed to take 50% of the GTA wastes after year 2000 with flexibility to accommodate less material over a longer period of time should the 50% diversion target be exceeded.



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## 10.4 THE BASIC SYSTEM

The basic long-term system will include reduction, re-use, collection with source separation, processing, composting and energy-from-waste and/or landfill disposal components as outlined above.

At this time it is proposed that only the key components of the basic system be considered. Those components which are common to the basic system are not included, as discussed in Section 9. For example details of receiving points for waste; receiving facilities; and transportation will depend upon the location, types and size of the facilities proposed for each key component. The Research and Development however is discussed further as it is important in the further evaluation of key components of the system.

The reduction, re-use and landfill disposal alternatives are common to all approaches. Other diversion components also contain common elements such as composting of yard wastes and separate organic waste streams, and the collection and processing of construction and demolition wastes. Components for the collection and processing of commercial and industrial wastes could also be common.

However, the best way of achieving significant diversion of wastes by these elements has not yet been demonstrated for the GTA. This entails not only proving how much waste may be diverted by reduction, re-use and recycling based on further development of the present efforts, but also the technological aspects of MRF and composting facilities to produce products marketable in the quantities relevant to the GTA. The approach to developing this basic system and defining the alternative methods included in it, is described in the following sections.

## 10.5 COMPARISON OF APPROACHES TO DEVELOPMENT OF A LONG-TERM SYSTEM

The weakness in choosing, at this time, between fundamental means of meeting the critical diversion criteria as described in Section 10.4, the Basic System, affects the options available to SWISC for proceeding with the next step in establishing a long-term waste management system. Three options are submitted for SWISC's consideration namely: a High Risk approach; a Minimum Risk approach; and a Managed Risk approach.



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**Option 1 - High Risk Approach**

This involves committing at this time to build full scale facilities using the most promising, but currently unproven, technologies. RFPs would be called in the Fall of 1990 for total systems from which a preferred system would be selected for preparation of an EA in order to have a system in operation by at least 1996.

The disadvantages of this option include:

- the RFPs will not provide sufficient additional information (Fall 1990), to make the best choice of components
- the RFPs for a total system will put proponents (and SWISC) to considerable expense to prepare proposals on which a decision might be expected. This could lead to the selection of a system which was not in SWISC's best long-term interest.
- possibly commit SWISC to large capital expenditures for facilities which might achieve diversion targets but not produce the most marketable products for the GTA or be the most compatible with the environment. Unproven components would be tested at full scale with associated high cost.
- reduce the flexibility to respond to local conditions throughout the GTA. This involves the potential to diffuse current efforts to achieve Diversion and lose public support.
- the siting of Disposal facilities may be achievable but there would still be difficulty in selecting the optimum sites for the number and type of Diversion facilities based on the lack of alternatives in the EOIs.
- the response may be too limited to satisfy the EAA.

There are no apparent advantages to proceed with this option and therefore the High Risk approach is not recommended.

**Option 2 - Low-Risk Approach**

This approach involves calling for proposals on proven technologies only and monitoring technological developments elsewhere: these developments would then be selected and implemented when they are proven as suitable for the GTA long-term system.



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The disadvantages of this option include:

- proposals would only be called for Disposal options involving EFW (including RDF) and/or landfills
- without additional efforts to develop Diversion facilities, it is unlikely that the Diversion targets will be achieved, or be close to being achieved, in time for the SWISC deadline dates
- historically, technologies which may be acceptable in one geographic area and under different economic conditions, may not be applicable for the GTA and its markets. It is difficult to properly assess all aspects of a technology at a remote location. However, by testing and refining these technologies at a local level, they may in fact be developed to satisfy GTA conditions with a full understanding of their implications
- while other technologies are being assessed, commitments may be made to less preferable alternatives

The advantages of this option include:

- minimal risk in terms of capital investment
- delays in commitment to available technologies provide the opportunity for other technologies to be identified
- time would be available to refine and assess the Diversion achievable by existing means, provided sufficient investment is made in the short term.
- flexibility for a long-term system is maintained.
- maximum participation of all interested parties may be developed.

Although there are significant advantages to this option, it represents an historical approach which does not meet the urgency and critical nature of the waste disposal situation in the GTA. A more aggressive program is required to meet the needs and principles of SWISC and satisfy an EA Board that the GTA representing at least one third of the Canadian economy, has taken a reasonable step to satisfying its long-term waste management needs.



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**Option 3 - Managed Risk Approach**

This approach is to build and monitor commercial-scale demonstration facilities for promising diversion technologies and to use information from these projects as input into the selection of the long-term waste management system. More specifically, it is proposed to:

- continue to implement the 3Rs Action Plan recommendations and evaluate their contribution the diversion target;
- fast tracking the most promising diversion technologies RFPs by the fall of 1990 to build demonstration projects in order to test other, supplementary and/or alternative technologies as identified in the report;
- on the above basis, choose and scale-up or build multiple units of the most appropriate technologies for the GTA as identified in Sections 5.4 and 5.5 to have a basically sound long-term system by 1996;
- call RFPs for disposal facilities by the fall of 1990 based on the proven technologies of EFW (including RDF) and/or landfill.

The disadvantages of this option include:

- the risk of capital investment in demonstration projects which may not meet SWISC's objectives
- the need to identify appropriate sites for the demonstration projects at an early date
- the need for a major organizational effort to prove demonstration projects and select the most appropriate for full scale implementation by 1996

The advantages of this option include:

- a sound basis for selecting appropriate diversion technologies for GTA conditions and markets
- the demonstration plants would provide firmer cost data and local examples of such facilities with respect to environmental and siting requirements
- additional diversion would be achieved in the short term



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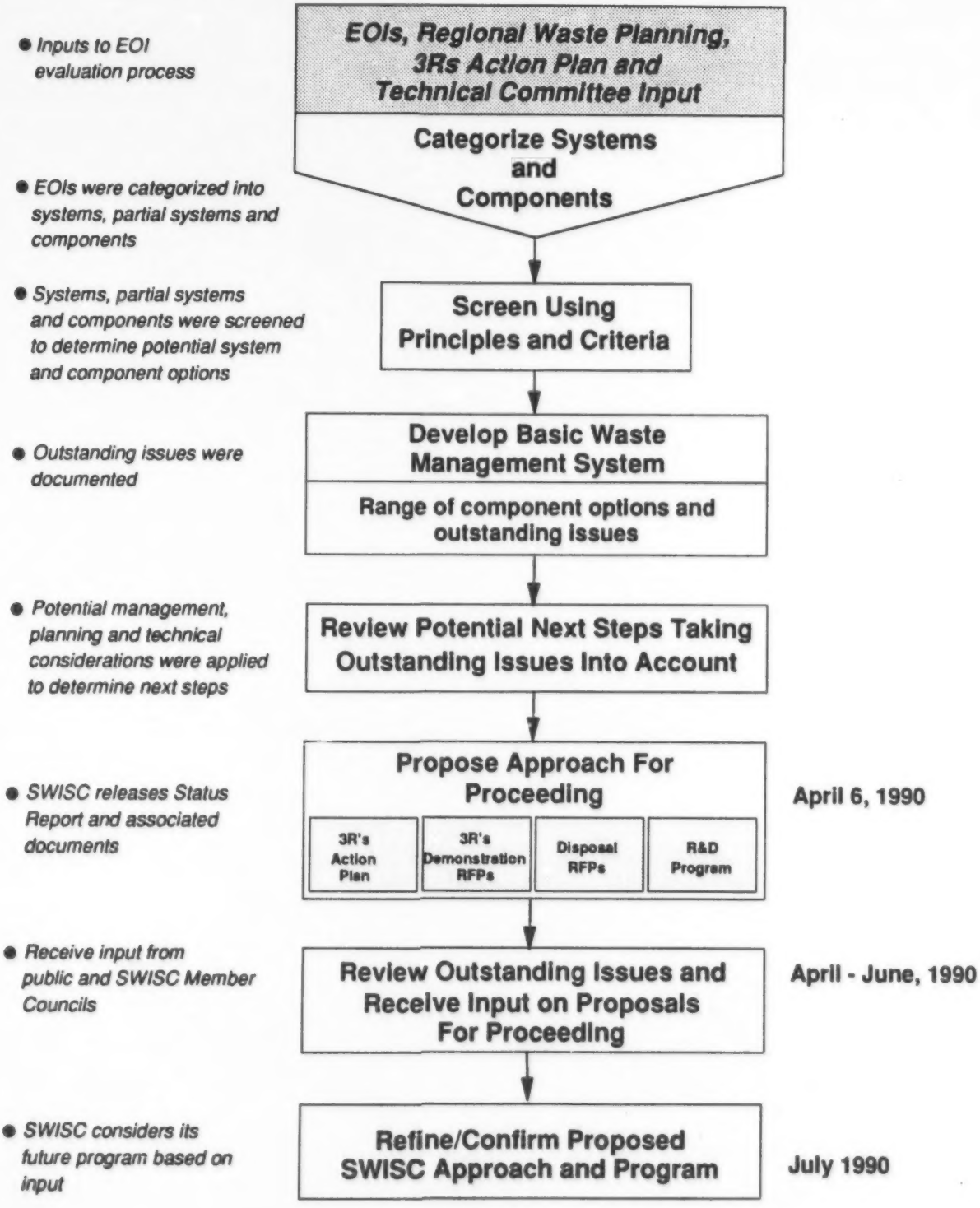
# Figure 10.6

# EVALUATION PROCESS AND PROPOSED APPROACH FOR PROCEEDING


• Inputs to EOI evaluation process
EOIs, Regional Waste Planning, 3Rs Action Plan and Technical Committee Input
Categorize Systems and Components
• EOIs were categorized into systems, partial systems and components
Screen Using Principles and Criteria
• Systems, partial systems and components were screened to determine potential system and component options
Develop Basic Waste Management System
Range of component options and outstanding issues
• Outstanding issues were documented
Review Potential Next Steps Taking Outstanding Issues Into Account
• Potential management, planning and technical considerations were applied to determine next steps
Propose Approach For Proceeding
3R's Action Plan
3R's Demonstration RFPs
Disposal RFPs
R&D Program
April 6, 1990
• SWISC releases Status Report and associated documents
Review Outstanding Issues and Receive Input on Proposals For Proceeding
April - June, 1990
• Receive input from public and SWISC Member Councils
Refine/Confirm Proposed SWISC Approach and Program
July 1990
• SWISC considers its future program based on input

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- the demonstration plants can be tied to existing and proposed pilot projects throughout the GTA to maximize the benefits gained through increased co-operation. Their initial size would be set to permit immediate establishment under EPA approvals.
- the selection and processing of disposal options which will take longer to prepare for EA approvals, could proceed without delay.
- flexibility for a long-term system is maintained
- maximum participation of all interested parties may be developed

This option, Managed Risk, is recommended as the most appropriate to enable SWISC to meet its objectives and is therefore elaborated upon in Section 10.6.

## 10.6 DEVELOPMENT OF MANAGED RISK APPROACH (see Figure 10.6)

The following actions would be required to develop the recommended approach. Should this approach be acceptable to SWISC, these actions would be refined through detailed negotiations with respect to allocation of tasks; sharing of information; funding; and preparation of detailed schedules and budgets.

1. SWISC continue to expedite the 3Rs Action Plan to improve overall Reduction and Diversion in the GTA, including the recommended public involvement program and discussions with these respondents who identified actions which could be taken in the short-term (Section 5.3.1).

2. SWISC or its constituent municipalities would issue RFPs for demonstration diversion alternatives to be constructed as soon as possible at a scale sufficient to prove their suitability for a GTA long-term system (and the marketability of end products) and to provide and adequate basis of comparison between alternatives. The specific size and number of MRF and composting facilities to serve the GTA will depend upon the success of existing diversion strategies, the particular needs of each Region, and complex analysis of alternative combinations of waste generation areas, available sites, transportation and economies of scale. Large scale facilities, over 800 TPD in capacity as proposed in the EOIs, may provide a viable alternative to more numerous smaller facilities in meeting diversion targets.



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- Several facilities would be developed. The size of specific facilities would be determined in consultation with the MOE to avoid delays in approval. At present, EPA approval is required for a diversion facility which does not leave a residue for disposal of more than 200 TPD.

- Siting of facilities could be left to the Proponent, but preferably sites should be chosen by the host Region in consultation with the area municipalities from available, suitable lands. However, initial discussions should be held with Respondents to the EOIS to check if they have suitable sites.

- The facilities would be designed for maximum flexibility. Most MRF or compost facilities are available in modules with capacity of approximately 50 TPD or greater, so that more than one process could be utilized in a facility. Alternatively, space could be left for modification or replacement of a process which did not meet guarantees. The structures required to house the facilities should be designed for conversion to other uses.

- The implications of scale-up to the large scale capacity alternative are best evaluated by hands-on experience with plants in the order of 200 TPD. Experience at this level generally will reveal technological adequacy, cost practicality and labour compatibility.

- There are also economies of scale in building a 200 TPD unit as compared to 50 TPD.

- Competitive financing alternatives appear to be available which could be tied to performance and marketing guarantees.

- The provision of six demonstration plants in the order of 200 TPD or 420,000 TPY represents only 10% of the total waste stream. However, they could result in over a 50% increase in the amount of waste currently being diverted.

The information provided in Section 5 will assist in selecting preferred technologies as a basis for the RFPs. The following are examples of the type of demonstration facilities that should be constructed.



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- a 200 TPD MRF facility to process mixed Residential wastes remaining after the Blue Box separation at source (Group 1(b)).
- a 200 TPD Wet/Dry collection system (Group 1(a)), and MRF facility to process mixed Residential wastes. The design of this facility may also include for the processing of mixed Residential wastes after Blue Box separation at source.
- a 200-400 TPD MRF facility to process Commercial and Industrial wastes (based on Groups 1(a) and 1(b).
- at least three, 200 TPD MSW and segregated organic waste composting facilities involving various technologies using the windrow process and combined in-vessel and windrow composting process.

Selection of demonstration plants should include consideration of support for these diversion facilities which are tied to specific industrial development (such as EOI #77) which may decide to proceed on their own. The support would be proportional to the benefits received by SWISC.

Some of these demonstration facilities are already under consideration by the Regions. It is proposed that:

(a) Each Region consider which of the demonstration facilities are of greatest interest to them and how they relate to the scale of current pilot programs with a view to adapting them to provide maximum benefit to the GTA as a whole. For example:

- Halton is embarking on a pilot scale program for Wet/Dry collection and processing;
- Peel and the City of Mississauga are proposing composting pilot programs for separated organic wastes in addition to windrow composting of yard wastes;
- Durham is proposing to construct full scale composting facilities to meet the 25% Diversion target by 1992;
- Metro Master Plan Discussion Paper No. 7.1 proposes a 190 TPD prototype compost facility and a 190 TPD prototype dry waste sorting plant;
- York is proposing to construct a Recycled Materials Processing facility for materials from their Blue Box program.

(b) Siting criteria should be established and a review of available sites conducted to determine where the plants may be constructed as soon as possible. Siting guidance may be obtained through the public consultation program.



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(c) A cost sharing formula, including funding from the MOE, be developed.

(d) Each Region be responsible for the preparation of RFPs, construction and operation of its facility(ies) with full sharing of experience with SWISC. SWISC would provide common "proofing" criteria to ensure that all the information required by SWISC is obtained from each facility.

(e) SWISC requests that the MOE develop specifications for end products and assist in finding markets for materials.

3. SWISC would convene a meeting of those respondents who proposed systems for handling (a) Commercial and Industrial and (b) Construction and Demolition waste streams, to develop a mutually beneficial approach to expediting diversion facilities and markets. The private sector may respond to these needs which now exist with minimal assistance from and co-ordination from the Regions. Alternatively, SWISC may pursue this directly to ensure that the necessary proven facilities are developed through the issuance of RFPs.

4. SWISC would proceed with the issuance of RFPs in the Fall of 1990 for Disposal facilities which can be implemented by 1996. The facilities should be limited to receiving no more than 50% of the waste generated after the year 2000.

   Both EFW (including RDF) and landfill are proven disposal alternatives. The decision to proceed with EFW and landfill, or landfill only, will depend upon the additional details which would be provided in the Proposals, such as:

   - locations and compliance with the receptive host policy
   - total landfill capacity available
   - specific site conditions with respect to the total environment criteria
   - projected energy requirements
   - relationship to other components of the system
   - costs

   It should be noted that the proposal to construct demonstration plants for diversion technologies within the GTA, should not preclude the alternative to locate full scale diversion



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facilities outside the GTA for at least part of the GTA total wastes as proposed in some EOIs. Advantages of such an alternative may include the development of secondary industry and availability of markets for compost.

Further consideration would be given to inclusion in the EFW alternative of refinements which would allow for testing of thermal processes which claim to produce an acceptable lightweight aggregate. EFW capacities can be staged to meet requirements depending upon the success of the Diversion program. Landfill life would be extended should the 50% target be exceeded as a result of additional EFW capacity coming on stream.

The information provided by the EOIs and summarized in Section 6.0 would form the basis for preparation of these RFPs. Specific sites within and outside the GTA would be considered for all disposal options.

5. The Technical Committee would ensure that all information generated from the 3Rs Action Plan, the demonstration plants, and other sources with respect to waste management is available to SWISC so that the long-term plan is state-of-the-art and flexible enough to maintain that condition.

   Implicit in that plan would be the determination of additional needs for R&D especially with respect to Disposal alternatives not yet proven, and the definition of the ultimate R&D capability. The type and location of this latter facility, if a new one is required for SWISC, would be determined after selecting the preferred waste management system.

   In summary, the managed risk approach for the development of a long-term system will provide the basis for achieving maximum Diversion and Reduction of wastes, minimizing Disposal needs, and ensuring that the system is flexible and responsive to new technologies and change over the long-term.



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## 11.0 NEXT STEPS

The following steps are proposed to continue the development of the long-term waste management system.

### 11.1 RESPONSE TO TECHNICAL REVIEW OF EXPRESSIONS OF INTEREST

SWISC would consider this report and release it to the participating municipalities, the respondents to the EOIs, and the public for consultation and input as planned.

This should include:

- continued implementation of Part 2 of the Public Involvement and Communications program to the SWISC process, including a series of public meetings in May, 1990
- a meeting with EOI respondents to brief them on the status of the SWISC process in April, 1990
- receipt by SWISC of Regional Council and Public input in May, 1990
- a SWISC response to Regional Councils and the Public in June-August, 1990

The issues to be addressed should include:

- the appropriateness of the conclusions and recommendations arising from the Technical Review of EOIs report
- the criteria to be used in the RFPs for the siting and selection of demonstration and disposal facilities
- the extent of export of wastes out of the GTA and these components for which export is most appropriate
- number and size of facilities required
- private-public interface
- organizational structure
- the amount and type of materials to be handled by each of the participants (i.e. Municipalities, Regions, SWISC)



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## 11.2 COMMITMENT TO 3RS ACTION PLAN

SWISC should establish with each of the participating municipalities their commitment to the 3Rs Action Plan and the SWISC and MOE roles in assisting in its implementation.

The issues to be addressed should include:

- the common portions of the 3Rs Action Plan which would be implemented on a GTA wide basis
- those portions of the plan which would be led by specific Regions and degree of participation by others
- SWISC's role in supporting the plan
- means of funding
- allocation of staff and resources
- the respective roles of the Public and Private sectors including the relevant Respondents to the EOIs
- direction from the Province on specific waste reduction and reuse targets as well as a plan for achieving these targets

## 11.3 IMPROVE DEFINITION OF WASTES TO BE HANDLED

To provide a common basis for addressing succeeding steps in the development of the waste management system,the Technical Committee should provide:

- an update of waste generation quantities from each Region
- compile all information on the composition of wastes available from recent studies. This information will not be complete and, by the nature of the problem, will change with time. Changes can be accommodated in the terms of RFPs and will avoid the confusion experienced by Respondents to the EOIs in this regard.
- advice on the alternatives for control/direction of wastes from the Public and Private sectors
- ongoing monitoring of the large quantities of "clean fill" and excavated soils meeting the decommissioning guidelines and used as fill such as presently deposited at the Leslie St. Spit, to ensure that they will not become an additional load on the Regions' waste disposal facilities.



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## 11.4 ISSUE RFPS FOR DEMONSTRATION PLANTS

Requests for Proposals for demonstration plants should be prepared and issued as soon as possible. This will require further co-ordination with the Regions and the MOE to agree on who will take responsibility for which plants; the determination of suitable sites; the final selection of appropriate technologies; and funding arrangements.

The timing is critical with respect to choosing the preferred diversion alternatives for the EA submission on the total system. The preliminary work should be started immediately, as the investment risked over the next few months would be justifiable even if this approach is subsequently rejected.

The issues to be addressed immediately by SWISC should include:

- Regions which will take the lead on various facilities
- the preparation of the basic information to be included in each RFP to allow SWISC to evaluate the potential role in the long-term waste management system of the technologies tested.
- number and size of facilities
- funding and sharing of information, including MOE support
- more information on different technologies to select a list of bidders
- siting criteria and selection
- flexibility in design
- collection methods
- scale of modules and total facility
- specifications for end products
- marketability of end products
- approval requirements

## 11.5 CO-ORDINATE RESEARCH AND DEVELOPMENT

The Technical Committee should be authorized to ensure that all information required to finalize a long-term waste management system be readily available to SWISC and its member Regions. This group would be responsible for:



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- Co-ordinating the implementation of the 3Rs Action Plan and evaluating results
- Co-ordinating the implementation, evaluation and any modifications required for the demonstration plants.
- Keeping up-to-date all information obtained on new processes in the waste management field. This would include assembly and analysis of information from the Provincial and Federal Governments; area municipality staff; consultants; and suppliers etc.
- Recommending to SWISC any areas which should be pursued further,including the award of R&D contracts. This could also include those disposal alternatives which were considered to have potential for the GTA.
- Dissemination of information to participating municipalities
- Recommend the timing and specifications for an R&D facility. This facility may be best defined with respect to type and location when the preferred waste management system is selected.

## 11.6 ISSUE RFPS FOR DISPOSAL FACILITIES

EOIs for disposal facilities are considered to represent alternatives capable of advancing to further evaluation at the full scale RFP stage. In light of the time available to complete technical studies, prepare an environmental assessment and progress through the approvals process, the original target date for issuance of RFPs, September-October 1990, should be maintained if at all possible.

SWISC has adopted the principle of locating all facilities in receptive communities and that a reasonable range of alternative sites can be identified through the use of a receptive community criterion as a primary screen. Any sites meeting that criterion would then be evaluated and compared in a systematic and traceable manner.

In view of the fact that only two receptive communities were identified in the EOIs, it is necessary to meet with respondents proposing disposal facilities as soon as possible to obtain additional information on the status of their sites vis a vis the host communities. The purpose of such meetings would be to ascertain the probability that a reasonable range of alternative sites will be identified through the use of a receptive community screening criteria in the RFP process.



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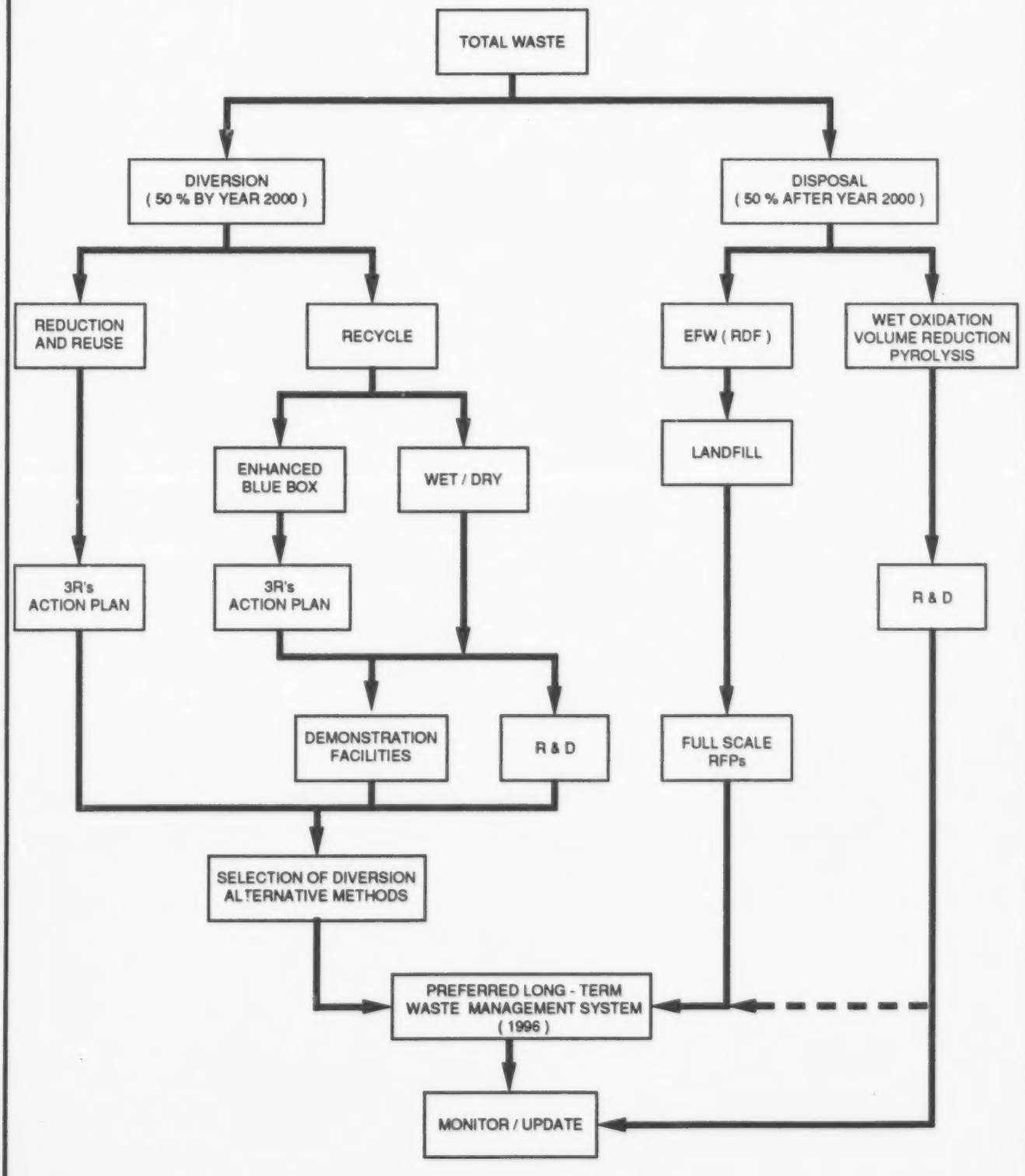
## FIGURE 11.1: SUMMARY OF PROPOSED APPROACH



It is also necessary to continue and expand SWISC's efforts to identify receptive communities for respondents currently looking for sites.

The issues to be addressed would include:

- compliance with EAA procedures, especially the use of a receptive community criterion as a screening mechanism
- site selection and RFP criteria, including receptive community issue
- effect on criteria of 50% diversion
- different levels of investigations and information on suitability of sites proposed and how this affects selection process
- what total capacity and number of facilities should be taken to EA hearing to ensure that enough capacity is approved. Cost implications and who pays?
- ownership and operation

## 11.7 CONCLUSION

The proposed approach is summarized on Figure 11.1. Those EOIs which proposed energy from waste and landfill components will be considered further in the preparation of RFPs for full scale operations. Those which proposed material recovery and composting facilities will be considered further by the Regions who will prepare RFPs for demonstration projects. Those which have been identified as of immediate interest to the 3Rs Action Plan will be contacted by the 3Rs task force. Finally, those which have been referred to R & D will be prioritized by the Technical Committee and decisions made on further liaison with the respondents.

The implementation of the proposals outlined above will provide valuable contributions to solving the waste crisis currently facing the area and maintain SWISC's objective of providing a long-term waste management system for the GTA by 1996.



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